THE STRUCTURE, ORGANIZATION AND FUNCTIONING OF MANUFACTURING COMPANIES IN SOUTH AFRICA

by

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SUMMARY.

The research problem that this study sought to address stemmed from a lack of knowledge about South African organizations and a dearth of empirical, quantitative research into organizations, organization structure and organization climate in this country. Five research hypotheses were formulated to address this problem and its attendant subproblems.

A comprehensive review of the related literature and research was carried out and *Organization Theory* was traced to its earliest beginnings. A number of schools based on Max Weber's bureaucratic ideal type were described and contrasted. Much attention was paid to the work of the Aston group in the United Kingdom and to their efforts to operationalize Weberian concepts and to incorporate them into a replicable body of quantitative research. Points of departure were re-examined and some new twists to Systems Theory and Structural Functionalism were considered.

It was established that the demographic characteristics of both the sample and the population were similar enough for the results of this study to be generalised to the population with some degree of confidence.

Much care was taken to test and validate each of the scales that comprised the questionnaire, and item analyses and factor analyses were carried out for every variable and group of variables. The measures developed in other parts of the world and by other researchers performed very well in a South African setting - as did the measures developed specifically for this study.

Statistical associations and causal relationships between the various sets of variables, both at the sector level and at individual industry subgroup level, were sought by means of multiple regression analyses. Broad support was found for a 'culture-free hypothesis' that there are a number of stable relationships between organizations and their context; and these relationships will be constant in direction and strength regardless of differences in structures, or in contexts of structures between societies. Importantly, there were also a number of significant differences between this study and the findings of other studies which reflected South Africa's unique blend of developed and developing cultures and value systems. These differences provide fertile ground for future research in the field of *Organization Theory*.

KEY TERMS.

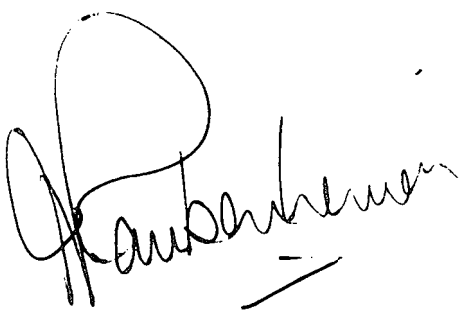
Organization; Organization Theory; Organization context; Organization climate; Organization structure; Organization design; Organization Studies; Bureaucracy; Organic Structure; Mechanistic Structure; Contingency Theory; Structural imperatives; Organization life-cycle; Structuring of Activities; Quantitative methods in organization studies; Organizational measurement; the Aston programme; Factor analysis; Multiple Regression analysis.

OWN WORK DECLARATION

I declare that :

THE STRUCTURE, ORGANIZATION AND FUNCTIONING OF MANUFACTURING COMPANIES IN SOUTH AFRICA

is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



W H Raubenheimer

THE STRUCTURE, ORGANIZATION AND FUNCTIONING OF MANUFACTURING COMPANIES IN SOUTH AFRICA.

TABLE OF CONTENTS.

CHAPTER TWO : REVIEW OF THE RELATED LITERATURE AND RESEARCH : A HISTORICAL OVERVIEW.

CHAPTER 3. REVIEW OF THE RELATED LITERATURE AND RESEARCH : CURRENT PERSPECTIVES.

CHAPTER FIVE : KEY CONCEPTS AND DEFINITIONS.

CHAPTER SIX : COLLECTING THE DATA.

CHAPTER SEVEN : PROCESSING AND TREATMENT OF THE DATA.

CHAPTER NINE : THE RESEARCH PROBLEM AND HYPOTHESES.

LIST OF TABLES

LIST OF ANNEXURES.

LIST OF DIAGRAMS.

PREFACE AND ACKNOWLEDGEMENTS.

After I had completed my MBL degree a question that was often asked of me was, "So when are you going to do your doctorate?" My standard response was, "Only when a subject stands up and bites me."

In the end it was more a case that the subject crept up and nibbled at me. Eventually the gnawing became so incessant and demanding that something had to be done about it. It was, particularly, the seeming structural anomalies within the Electronics Industry that finally precipitated the desire to study South African Organizations and their structures and climate.

When an initial literature search revealed that very little had been done in the field of quantitative *Organization Theory* in this country, the urge to make a purely South African contribution became quite consuming.

Insofar as acknowledgements are concerned, the people to whom thanks are owed can be divided into three broad groupings: those whose assistance was tangible and material; those who provided academic support and guidance; and, finally, those whose assistance was more in the nature of encouragement and succour, especially when morale occasionally flagged.

Top of the list with regard to tangible assistance are, of course, the 528 senior executives who responded to my questionnaire. Virtually all of the respondents were from the most senior ranks of their organizations' management and this was reflected in the calibre and integrity of the data that were gathered. I am also deeply indebted to my employers, the Allied Technologies (Altech) group, who sponsored my research in its entirety. In particular I must thank Dr David Jacobson who provided the initial direction and endorsement of my research proposal, and Kevin Godwin, who approved all the applications for financial assistance. On a more practical level, thanks are due to Donay, Ria, Charmaine, Angie and Patrick who packed 2 380 envelopes with questionnaires, covering letters and stamped return envelopes and then glued and posted them.

Under the heading of academic assistance I must, firstly, make special mention of my promoter, Professor Johan Murphy, who provided valuable assistance but who, nevertheless, kept his advice and guidance low key and allowed me to explore in my own way. Paolo Candotti, friend and *cum laude* MBL graduate, proof-read the manuscript and provided valuable insights. The team from the department of statistics at the University of South Africa, especially, Professor Steffens and Riëtte Eiselen, helped me immeasurably in coming to grips with some of the more tricky statistical issues. Lorraine Grobler, from the department of Library Services at Unisa, was always quick to respond to my requests for information and provided research assistance that was efficient and effective. Finally, I must also thank Professor Peter Clark of the University of Aston Business School in the United Kingdom for answering all of my questions on the Aston research, and also providing me with a recent example of the Aston methodolgy in practice.

Support of an encouraging and inspiring nature was forthcoming from many people but especially from friends and family. In this respect I am particularly beholden to my wife, Anne, for her advice and willingness to listen and for her unconditional and unstinting encouragement; and also to my elderly mother whose greatest expectation is now to attend my graduation ceremony.

A doctorate is the ultimate academic achievement and, at the end of the day, the path to this particular achievement started long ago in another time and another country with the first tentative registration to do a Bachelors degree by correspondence. This one is for you, Dad.

Know that wisdom is thus for your soul;
If you find it, then there will be a future,
And your hope will not be cut off.

Proverbs 24 : 14

CHAPTER ONE: THE PROBLEM AND ITS SETTING.

1. STATEMENT OF THE PROBLEM.

This thesis examines South African Industry, specifically companies in the manufacturing sector, in an effort, firstly, to discover the nature of the organization structures within this industry and, secondly, to identify the exogenous factors and influences from an *Organization Theory* viewpoint that exercise a critical effect on the structure and function of the companies that comprise the Manufacturing Industry.

Organization Theory is a relatively new science to the extent that there is still some argument among theorists as to where it belongs in the world of academe. Certainly, the discipline's roots are firmly in the Behavioural Science faculty and its foundations are steeped in the work of sociologists and social psychologists. Names of prominent social scientists such as Weber, Parsons, Pareto, Mayo and many others are still frequently encountered, even in the work of modern day organization theorists. In recent years, however, their has been a distinct shift away from the sociological base and into the Business Schools. This seems to be only logical since by far the majority of organizations are business institutions. With the increasing study of business organizations over the past 25 years or so, a mountain of empirical organizational research has been generated in most advanced economies of the world.

This is a phenomenon that seems to have by-passed South Africa, even though abstract organizational and environmental concepts were first successfully operationalized in the late 1960s and early 1970s. In the words of Dr Piet Human (1993 : 205) :

> There is a paucity of serious scientific studies of the South African business firm....Our researchers and writers on organization appear to be exclusively interested in idealistic futures and exotic answers and would seem to find the very important project of explaining reality for what it is, distinctly unattractive.

The research problem, then, that this study attempts to address relates to the lack of knowledge about South African organizations.

This lack of knowledge is sometimes reflected in the ambiguities and enigmas that are revealed when classical management theories and structural models are applied to local organizations. In fact, it was the seeming paradoxes and inapplicability of accepted organization theory concepts in the South African Electronics Industry that triggered this research. Before looking at the research problem in more detail, it may be instructive to briefly pursue these apparent structural anomalies in the Electronics Industry.

2. ORGANIZATION STRUCTURE IN THE ELECTRONICS INDUSTRY.

On the surface, the Electronics Industry in South Africa appears to be characterized by predominantly bureaucratic structures; mechanistic in form and function and strongly hierarchical. The reward and remuneration systems are extraordinary in order to cope with a historical shortage of skilled professional people. There is, therefore, a high degree of formalization and strong emphasis is placed on job grading systems and salary scales, particularly as they relate to fringe benefits such as a company car entitlement.

The conventional wisdom would have us believe that an organic structure is by far the best design for a high technology environment, and that a mechanistic form is incapable of providing the flexibility and speed required to be competitive in a fast-changing, dynamic industry. And yet, among South African high tech. firms, the organic form is the exception rather than the rule.

Does this suggest that, in terms of classical organization theory, the firms that make up the South African Electronics Industry are structurally ill-equipped to face the challenges of the turbulent, competitive world markets?

2.1 Technology in the Electronics Industry.

The technology employed by the South African Electronics Industry is largely imported, with successful adaptations being engineered

in South Africa for local operating conditions. There have been important local breakthroughs as well, particularly in the fields of weaponry and defence. In conversation with the writer, Dr David Jacobson, Technology Development Executive of the Allied Electronics group, has said that South Africa's information systems technology is up with the best in the world. Local software industries have also developed adaptations and products that can legitimately be described as leading edge applications.

Paradoxically, this translates into an industry that, despite its apparent structural aberrations, is effective - competitively and technologically speaking.

How is this possible? And how do other South African Industries compare with the accepted precepts of Organization Theory? It will be seen later in this study that the South African Electronics Industry has functioned in an environment that is very different from the typical high technology context of advanced, Western economies. The mechanisitc form was, in fact, entirely appropriate to South African circumstances.

3. THE SUBPROBLEMS.

Turning back to the broader research problem which is the subject of this study, closer examination has indicated that it could be subdivided into five facets which lent themselves to the formulation of hypotheses to be tested. These five facets, or subproblems, are outlined below.

3.1 The First Subproblem.

There has been little empirical research done on the structure and environment of organizations in South Africa and no quantitative, structural research, as far as is known, has been conducted on

organizations in the South African Manufacturing Sector. *The first subproblem, then, was to make a contribution to* ***Organization Theory*** *as it relates to South African business organizations by determining whether there are contingencies and imperatives which shape the structures of companies in the Manufacturing sector.*

3.2. The Second Subproblem.

In order to gauge the appropriateness of the organization structures of manufacturing firms, it was necessary to analyse the context within which they function and to evaluate their interactions with their task environment and domain. *The second subproblem was to evaluate the operating environment of the South African Manufacturing Sector to establish its degree of turbulence and uncertainty; and to identify the major factors, exogenous to organizations, which influence and mould structure.*

3.3. The Third Subproblem.

Imported *Organization Theory* concepts may simply not apply in the South African milieu - and assuming that they do may have the effect of negating the good management decisions that are made, or compounding the bad ones. *The third subproblem was to evaluate whether conventional wisdom (e.g. organic structures should predominate in a high tech. industry) is applicable to the South African environment.*

3.4. The Fourth Subproblem.

The Fourth subproblem was to evaluate and analyse the treated data to gauge the effects, if any, of South Africa's uniqueness on its organizational structures. This uniqueness is, inter alia,

characterized by :

- more than 30 years as the world's polecat
- decades of ever-increasing sanctions
- years of "affirmative action" for the white Afrikaner section of the population
- exemplified by the Public Sector, until one in every four employees was a civil servant; a record beaten only by the monolithic bureaucracies of the former communist world
- the most developed economic sector in Africa
- a unique combination of first and third world elements, particularly the post-Wiehahn labour movement
- a chronic shortage of high calibre managers as well as skilled and professional people
- a high level of taxation and government intervention in the economy, both by regulation or through controlled industries
- and, finally, the most recent fundamental sociopolitical redefinition of South African society.

3.5. The Fifth Subproblem.

Having established the critical relationships at a macro level, one is left with the question of the impact of organization structure at a more focused level of analysis. *The fifth subproblem, therefore, was to explore the influence of structure at organization and group level to establish the linkages, if any, between aspects of structure, environment, and organization climate and organization culture.*

4. FORMULATION OF THE HYPOTHESES.

A number of hypotheses were suggested to test for relationships among selected environmental or contextual variables and various aspects of organization structure, configuration and climate.

The first hypothesis was that South African manufacturing organizations are shaped and influenced by a number of contingencies and structural imperatives which determine their structure, design and functioning.

Prominent among these imperatives are organization size, power control, technology, dependence on external organizations or resources and the degree of environmental turbulence and change.

The second hypothesis was that organizations in the South African Manufacturing Sector are affected differently by contextual variables. Generally, structuring of activities (specialization, standardization and formalization) will be more closely related to size and power control and less closely to technology; while design or configuration variables will be related more closely to power control and technology and less closely to organization size. Centralization, or concentration of authority, will be related mostly to dependence and power control. There will, nevertheless, be significant differences between industries within the manufacturing sector.

The third hypothesis was that, in South African Manufacturing firms, Organic Structures (characterized by participatory decision making, a decentralized hierarchy of authority, and few formal procedures) will be associated with conditions of high environmental uncertainty and low dependence. Conversely, Mechanistic Structures will be associated with conditions of low environmental uncertainty and high dependence.

The fourth hypothesis was that a number of internal variables and organizational characteristics will exhibit relationships to each other that are consistent with findings in other major organizational research projects throughout the world:

- ***Vertical Span of Control or Organization Depth** is positively related to Formalization, Functional specialization, Decentralization, Lateral span of control, and the administrative staff ratio.*

- *Formalization is positively related to Functional specialization, Professional qualifications, Decentralization, and the administrative staff ratio.*

- *Functional Specialization is positively related to decentralization and the administrative staff ratio.*

- *Decentralization is positively related to the administrative staff ratio.*

- *Type of structure, shape or configuration is related to Formalization, Functional specialization, and Decentralization.*

The fifth hypothesis was that contextual variables which shape structure will also influence aspects of organization climate. Thus size will be positively related to scientific and intellectual orientation, employee involvement, readiness to innovate, interpersonal aggression, emotional control, leaders' psychological distance, and concern with following rules. Complex Technology is negatively related to emotional control, interpersonal aggression, and leader's psychological distance, and positively related to questioning authority, scientific and intellectual orientation, concern for employee involvement, and readiness to innovate. Dependence will be related positively to emotional control, interpersonal aggression, rules orientation, and leaders' psychological distance; and negatively to questioning authority, concern for employee involvement, and readiness to innovate. Finally, power control will be positively related to leaders' psychological distance and concern for following rules and negatively related to interpersonal aggression, questioning authority, scientific and intellectual orientation, and concern for employee involvement.

5. THE DELIMITATIONS.

* The study was confined to the South African Manufacturing Sector and cannot, therefore, be considered to be normative for other sectors such as mining, service or retail.

* Industry-wide information was gleaned from the data base of the Bureau of Market Research of the University of South Africa. The research population comprised all organizations with a headcount of 150 or greater who fell within the manufacturing division of the Standard Industrial Classification of all Economic Activities. This was a total of some 2380 organizations.

* The data upon which this study based its conclusions were cross-sectional in nature and no attempt was made to validate any of the conclusions by means of longitudinal study. Most of the analysis was quantitative, and qualitative data were not sought except for a brief discussion of the South African Electronics Industry. Key informants in the Electronics Industry included office bearers and prominent people in national and industry associations as well as executives in the Allied Electronics Group of companies.

* The study was limited to identifying and analysing the causal relationships between variables and did not attempt to gauge the quality of the "fit" between these variables in terms of organisational performance or organization effectiveness. Nevertheless, by including the concept of Organization Climate in the analysis of organizations, the study did achieve an indirect measure of organization effectiveness by establishing the degree to which an organization's climate is functional and facilitating as opposed to dysfunctional and inhibiting.

6. ASSUMPTIONS.

The First Assumption was that the information garnered through the Bureau of Market Research's data base will be illustrative of the Manufacturing sector as a whole.

The Second Assumption was that the perceptions of structure and climate of organizations in the Manufacturing sector which are held by the respondents in this study are representative of the Manufacturing Industry as a whole.

The Third Assumption was that research methods which have been developed in organizational studies throughout the world in both developed and developing economies would be replicable in South Africa with the minimum of adaptation to local conditions.

The Fourth Assumption concerns the sociopolitical environment and stated that there will be relative stability flowing from the current political changes and the forces shaping industry will be more competitive than statutory.

7. THE IMPORTANCE OF THIS STUDY.

The importance of this study can be seen from three different perspectives. Firstly, it attempted to answer the question, *are organization and management theories developed in advanced western countries valid in a developing country* - specifically, in a country with South Africa's unique mixture of old and new worlds and first and third world values?

Secondly, if the organization and management theories imported from advanced western countries are not applicable in South Africa, this study attempted to answer the question, *how and why not?*

And thirdly, it attempted to make a contribution to *understanding the forces that shape South African Manufacturing organizations* at this most crucial of junctures in their history, as they stand braced to enter the hurley-burly of international competition on an equal footing with other players in the global market, and as they extend their sphere of operations into areas previously unreachable.

6. SUMMARY.

In this first chapter the point of departure of this study has been set out and the research problem and its attendant subproblems were

identified and discussed. Several hypotheses were spelt out and the delimitations encountered and the assumptions that were made were also outlined. Finally, a brief indication was given of the value of this study and its importance to the body of scientific knowledge about organizations, particularly in South Africa at this time.

The following two chapters will present a comprehensive review of the related literature, beginning with the earliest recorded structural issues and leading up to the development in recent times of a cogent body of knowledge called *Organization Theory*.

In common with many other areas of scientific endeavour, the most outstanding contributions to the field of Organization Theory have occurred only in recent times and by far the majority of writers, researchers and theorists have existed in the last 100 years. And, typically, the most substantial theoretical advances have occurred in the latter half of the 20th Century.

CHAPTER TWO : REVIEW OF THE RELATED LITERATURE AND RESEARCH : A HISTORICAL OVERVIEW.

1. INTRODUCTION.

Although it was said in the last chapter that Organization Theory is very much a 20th century discipline, and that the major theoretical, scientific and academic contributions have occurred only in the last 100 or so years - evidence, nevertheless, abounds of the major organizational feats that have been undertaken by mankind since the birth of civilization. The earliest records of Far Eastern and Middle Eastern civilizations of four or five thousand years ago are replete with the structural and administrative questions that have vexed human organizations, and which still do today.

In the context of reviewing literature related to a research problem, Behling (1979: 41) said, "Everything has an antecedent. To begin to investigate any problem...it is likely that one would trace that problem...to its deeper origins." So it is with Organization Theory. The only question is, how far back does one go in tracing the antecedents? Man is a gregarious creature by nature and when the earliest beings began to band together for mutual protection and survival, so a pecking order emerged and the pressure to organize and structure activities grew.

This chapter will, however, not examine the organizational and structural issues associated with prehistoric man. These are concepts that are best left to be explored by anthropologists, historians and archeologists. Rather, it is intended to begin with just a brief discussion - by way of example - of one or two of the greatest Middle Eastern and Mediterranean civilizations and their organizational achievements over the past 4000 or so years; moving on to touch briefly on renaissance and early industrial Europe, before concentrating on the most recent and meaningful research and academic discourses.

In the process of analysing the related literature and research it is inevitable that a stage will eventually be reached where certain

authors, or a particular body of scientific knowledge and research, begin to become familiar and are catalogued more than once - or even several times. (Behling, 1979: 43.) This is a natural process as the focus of the examination of the literature moves from broad and superficial to focused and thorough.

This was indeed the case with this study and, in the course of researching empirically-based Organization Theory, the work of the Industrial Administration Research Unit of the University of Aston in Great Britain was encountered again and again. This was particularly true in the context of Organization Structure and the issues of describing and *measuring* the dimensions of structure. The search of the related literature has revealed that an enormous amount has been written about Organization Theory but not a lot of it can be classified as useable in the sense that it represents a replicable body of empirical research. The Aston work was a clear exception and it has been the subject of numerous replications and extensions by researchers throughout the world.

Early in the course of this study, contact was made with the University of Aston. In a letter to the writer, Doctor Peter Clark, who is reader at Aston, comments, "I have been approached on the beach in Haifa and then in Sydney about the Aston scales(!) but I do not recall a South African application." Which tends to confirm the assertion made in the last chapter that there has been little or no empirical research done in the field of Organization Theory in South Africa.

2. FROM EARLY CIVILIZATIONS TO THE INDUSTRIAL REVOLUTION.

Early organizations were often of a military or religious nature and, even in undertakings that occurred before recorded history, some form of organization and administrative structure was necessary if the group, tribe or nation was to achieve its goals. Excavations in Pakistan and India have revealed that cities of 4500 years ago bore clear evidence of the physical trappings of organization and structure. They were planned in rectangular blocks and had water supply and drainage systems. (Ford, Armandi & Heaton, 1988: 20.)

2.1 The Egyptians.

Of the early civilizations the feats of the Egyptian kings are often cited as bearing testament to their organizational abilities. In 3100 B.C. King Menes first unified the upper and lower kingdoms and built his capital at Memphis. From here he centralized the monarchy and his government exercised control over the united kingdoms by means of a number of administrative and military measures. He also undertook vast engineering schemes, one of which was a masonry wall across the Nile which diverted the waters of the river for irrigation purposes. (Mertz, 1982 : 895)

The early Egyptians displayed awesome organizational skills in the process of constructing their temples and pyramids. The Great Pyramid of Cheops, for example, has a floor area of 13 acres and is constructed from over 2 million stone blocks. Each block weighs, on average, 2½ tons. It is calculated that more than 100 000 men worked for 20 years to complete this project. The sophisticated organizational concepts and structural controls necessary to carry this out must have been incredible, even by modern-day standards. Enormous quantities of stone had to be quarried, shaped, hewn, moved long distances - sometimes over water - and then placed properly. This vast undertaking included the planning, administration, coordination, and leadership of work teams as well as the logistics of providing sustenance and materials for the immense workforce. And then, at the end of the day, there was the problem of keeping everyone working toward the same common long term goal. (Ford et al, 1988 : 20.)

Ancient Egypt also excelled in the sphere of academic organization. This was exemplified by the library of Alexandria which flourished under the patronage of Ptolemy II. Major poets, writers, scholars, mathematicians, astronomers, philosophers and scientists gravitated to the Alexandria school until it rivalled

Athens as a centre for learning and culture. At its height it had faculties of medicine, mathematics, astronomy, literature, and many other subjects. Its facilities included a chemical laboratory, an astronomical observatory, an anatomical theatre, and botanical and zoological gardens. (Baker, 1982 : 484.) There were 14 000 pupils studying a variety of subjects at any one time. The administrative requirements and structural controls would not have been dissimilar to those of any large modern-day academic institution.

2.2 Moses and the Israelites

The following passage shows that many organizational principles that have been developed in recent times were, in fact, clearly understood some 3500 years ago.

> And Moses' father-in-law said to him, "The thing that you are doing is not good. You will surely wear out both yourself and these people who are with you, for the task is too heavy for you; you cannot do it alone. Now listen to me: I shall give you counsel...you be the peoples' representative before God, and...then teach them the statutes and the laws...and the work they are to do. Furthermore...select out of all the people able men...and place these over them, as leaders of thousands, of hundreds, of fifties, and of tens. And let them judge the people at all times; and let it be that every major matter they will bring to you but every minor matter they themselves will judge. So it will be easier for you and they will bear the burden with you."
>
> (Exodus 18: 17-22)

Jethro, the father-in-law of Moses, is possibly one of the world's earliest management consultants. Jethro observed that Moses spent most of his days making judgements and decisions for his people and was thus unable to attend to the important long term and strategic issues which affected the nation as a whole. His advice to Moses

was to decentralize the decision-making process and to delegate authority as a broad organizational strategy. The associated problems of retaining control and maintaining cohesion in a large decentralized structure were then addressed by the accepted bureaucratic means of standardization (teaching the people the work they are to do) and formalization (statutes and laws). And, of course, one is able to recognise the typical pyramidal organization chart so evident in modern companies.

It was only some 3½ thousand years later that the Aston and National studies (Child, 1972) explored the link between decentralization on the one hand, and formalization and standardization on the other. Certainly, Jethro understood that larger size would lead to greater complexity, and that the concomitant decentralization would require more formalization and standardization.

His advice to Moses would not be out of place in the board room of a present-day top 200 company.

2.3 Philip of Macedon and Alexander the Great

As an organization becomes larger it develops distinctive needs. These needs often give rise to novel coping mechanisms, such as innovative organizational designs and structural variations, which enable the organization not only to cope but to achieve even greater heights. Such positive adaptation is, of course, predicated on a leader who is intuitive enough to recognize the opportunities and threats and to capitalize on them.

The armies of Philip of Macedon (382-336 B.C.) and his son Alexander the Great (356-323 B.C.) are illustrative of how an organization can produce a successful structural response to the needs of a situation.

Philip of Macedon. Until the time of Philip of Macedon, military activity was characterized more by random, marauding bands of private militia who fought brief battles and raided one another on a sporadic group-on-group basis. They carried all their own supplies, ordnance and equipment and their goals were short-term and limited - engaging the enemy, winning or losing, and then returning home. Long term military strategy, tactics and logistics had not been developed.

Philip created and moulded an army with which he was able to unite disparate Hellenistic nations and city-states. It had an engineering corps, a general staff, and a logistic supply arm. It was thus able to sustain itself much longer in the field and lent itself to the achievement of more ambitious and longer term strategic goals. Philip's army also saw the beginnings of specialization in that it had embryonic forms of the three arms branches of infantry, cavalry and artillery. (Griffith, 1982: 225-227.)

Alexander the Great. When Philip died, his son Alexander III took over his army and immediately displayed his military and organizational genius. Alexander honed the army into a flexible, mobile, all-terrain fighting force of 35 000 men, 5000 of whom were the most effective cavalry unit ever seen. Alexander took the specializations introduced by his father and sharpened them further. His army was remarkable for its fine balance and combination of arms. Specialist, lightly armed Cretan and Macedonian archers who softened up the enemy; followed by Thracian and Agrianian javelin throwers; then the superb cavalry charge; and, finally, the core of 9000 infantry carrying shields and 18 foot long spears. Often, the infantry was not even required after the archers, javelin throwers and cavalry had done their work.
(Walbank, 1982: 468-473.)

Interestingly, Alexander added Intelligence, Public Relations and Propaganda functions to his army. These staff and support functions were often able to convince potential enemies of Alexander's power

and that fighting him would be futile; predating by more than 2000 years the efforts of both Tokyo Rose and Lord Haw-Haw in the second World War.

When he succeeded his father, Alexander had three key objectives:

- he had to assert control over the Hellenistic Empire
- he had to expand on his father's conquests with numerous far-reaching and long-term campaigns in Asia and north Africa, and
- he wanted his army's fighting prowess and successes to become widely known. (Ford et al, 1988: 21.)

His response to these objectives demonstrated his fine understanding of organizational demands. Apart from creating new types of fighting units, he improved support services and instituted wide ranging structural changes which brought about a decentralized chain of command more suited to the greater complexities of a large organization.

In an army so specialized that some men became highly trained cavalry, infantry or artillery officers, other men had to be assigned ordinary duties and be supervised, requiring standardized rules and procedures. Alexander, therefore, developed appropriate structural control innovations which enabled his army to maintain its sharpness and combat-readiness.

2.4 The Arsenal of Venice.

Renaissance Italy, apart from being in the vanguard of the cultural and artistic revival after the dark ages, was also a world leader in industry. The Arsenal of Venice, for example, was a ship building facility which covered 60 acres and employed up to 2000 workers. It was the largest industrial establishment of the 16th century. It employed mass production techniques that were later commonly credited to Henry Ford and the Model T. (Ford et al, 1988: 21-22)

The Arsenal had a three-fold mission. Firstly, the manufacture of

galleys, arms and equipment; secondly, the efficient storage of these items; and, lastly, assembly and refitting as required. In order to accomplish these tasks the Arsenal was organized into functional areas with a foreman in charge of each department. Ship building went through three standardized and carefully preplanned stages of production with different skilled workmen involved in each stage. The final assembly stage involved all the departments of the Arsenal as an unprovisioned ship was towed past a series of warehouses containing everything necessary to equip a battle-ready vessel. As the boat passed along the warehouse area, arms and equipment were added in the correct sequence, seams were filled with tow and pitch, the hull was covered with tar or grease, deck fixtures were fastened in place, and, finally, the rigging, moorings, and oars and arms for the crew were added. (Albers, 1969: 12.)

The efficiency of the assembly stage was demonstrated to King Henry III of France in 1574 when a vessel was assembled, launched, and armed in less than one hour.

The structural demands on the organization in terms of size, man-power, inventory management, and work group supervision must have been tremendous. That the Arsenal coped and adapted to these pressures by evolving a design and structure uniquely suited to its situation is remarkable. And all without the benefit of the insights provided by 20th century Contingency Theory.

2.5 Europe after 1500, and the Industrial Revolution.

There is no sharp dividing line between the economic life of the Middle Ages and the early modern world; although 15th century Europe did display many of the signs of the decay of an old order and the birth of a new one. It was, however, a slow process. Traditional organizations associated with trade and industry were reshaped as the ancient craft guilds began to break up and companies of merchants on the one hand and journeyman, on the other, started to assume control

of the specialized affairs of their own members. Guild control over industry began to crumble in the face of individual capitalists, or groups of capitalists, who assumed control of the entire production process from raw materials to finished goods in the textile, leatherworking, mining and metallurgical industries. (Wilson, Landes & Kemp, 1982: 219-255.)

The biggest influence on the structure of commercial organizations in early modern Europe was the availability of capital. Toward the end of the 16th century a second, more powerful, structural imperative began to make itself felt. This imperative was Technology.

As demand grew in light industries such as textiles, a system of distributing raw materials to cottage industry - the so-called "putting out" system - was developed by entrepreneurs whereby finished and semi-finished goods were produced by cottage workers from raw materials and tools provided by the merchant entrepreneur. The system offered many advantages. It shifted fixed costs to the workers, all the merchant needed was a room for storage, and at the same time it gave him access to a large pool of cheap labour. In bad times he simply cut back on what he put out, with minimal overheads and fixed costs to carry. However, in good times and as demand grew, the merchant entrepreneur was compelled to put out his goods to an ever increasing radius of workers - thus incurring a disproportionate increase in transport costs.

It was in the context of frustrated opportunity that the merchant entrepreneurs sought some way of concentrating work under one roof where the labour force could be supervised and controlled. The technology of the time made this impossible, until the invention of large machines driven by centralized inanimate power. For example, the spinning jenny invented by James Hargreaves, finally provided the means to collect individual workers together in what was to become known as a factory. This, and other innovations, heralded the incremental process which was later dubbed the Industrial Revolution.

The essence of the Industrial Revolution is illustrated by a number of innovations in product and process technology:

- the substitution of inanimate for animal or human power, particularly by the coal-fired steam engine,
- the substitution of machines for human strengths and skills,
- the invention of new methods of transforming matter, particularly industrial chemicals and iron and steel, and
- the organization of workers in large centrally-powered units and factories that made possible constant supervision and more efficient allocation of labour. (Wilson et al, 1982: 231.)

The catalyst for the industrial revolution was undoubtedly the railway. It enabled the economy to move rapidly to unprecedented heights by providing mobility for both capital and labour - and moving unheard of quantities of goods to and from the new industrial areas. In addition, the railway itself created an enormous demand for iron, steel, coal, wood, brick, and other materials which stimulated industry. Finally, the railway was a major provider of employment. At the peak of the railway boom in Great Britain in the 1840s it employed some 300 000 men in construction alone - more than the entire cotton industry. Spectacular engineering feats were achieved in laying thousands of miles of track, and the organization of labour into large gangs inspired new organizational methods. (Wilson et al, 1982: 232.)

The trend to bigness made possible by increased mobility and technological advances was reinforced in the 20th century by the achievement of economies of scale. Electrical power, the internal combustion engine, the electronic revolution, and instant communication have all contributed to the growth of today's mega-organizations. The concomitant imperatives and contingencies acting on organization structure have, in the last two centuries, increased immeasurably.

As scientists and researchers throughout history have been drawn to dissect, analyse and mull over complex phenomena and systems, so it has been with organizations. The growth in both the size and number of organizations ultimately spawned a new scientific discipline.

3. TOWARDS A THEORY ABOUT ORGANIZATIONS AND STRUCTURE.

The birth of a theory about organizations is generally regarded as being heralded by the formulation of the concept of Bureaucracy by the German sociologist Max Weber (1864-1920). His definitions have laid the foundations for all subsequent work that has been done on the subject.

The following sections will examine the historical background to the concept of bureaucracy and will then touch upon the major schools of thought which have contributed to the discipline of Organization Theory, as well as looking specifically at their influence on our understanding of organization structure.

3.1 Historical Background to Bureaucracy.

The Roman Catholic Church existed in a bureaucratic form for hundreds of years and many medieval city states also held a bureaucratic form. However, it was not until the strong bureaucratic states of Western Europe came into being, with their unified and centralized control of extensive territory, that it was possible for the bureaucratic form to spread and assume dominance in all forms of public, social and business life.

Initially, the activities of the state and the royal house were combined and only when they split did the concept of a state department, office or bureau come into being. Bureaucratization,

once established, expanded rapidly in the 16th and 17th centuries, dominated initially by the aristocracy as the state increasingly absorbed the functions of local government. Bureaucratic offices were commercialized and could be bought and sold - sometimes being created especially for this purpose. In France in the years 1620 to 1632 the sale of bureaucratic offices accounted for one third of state income. The opportunities for nepotism and corruption were obviously great in such a system.

After the French revolution and widespread reforms in the rest of Europe, pressure increased to professionalize the state bureaucracy. As people saw themselves as citizens rather than subjects, there was also a move to open the bureaucracy to all and it was no longer the exclusive domain of the wealthy or nobility. Entrance became by means of qualification - and neutrality and service to the public was emphasized. (Mouzelis, 1982: 484-497.)

3.2 Weber's Bureaucratic Ideal Type.

Weber initially formulated his theory of an ideal type of bureaucratic organization to explain the unique features of Western civilization. He was, therefore, concerned mainly with the state apparatus; only later did he broaden his theories to encompass all organizational forms: church, social, state and business.

The essential features of Weber's ideal type were:

1. A continuous organization with official functions bound by rules.
2. Specific spheres of competence with division of labour and provision of the necessary authority to office holders.
3. Organization into a hierarchy of offices with each lower office under the control of a higher one.
4. High formalization with dependence on rules and norms to govern behaviour. Only persons who have demonstrated ade-

quate technical training or ability considered for promotion or appointment to official positions. Administrative acts, decisions and rules are always committed to writing.

5. Separation of ownership and administration, and separation of employees' organizational and personal lives. Managers are professionals who are remunerated according to their rank or position in the organization.
6. Career paths for employees based on achievements, seniority, and the judgement of superiors.
7. Employees are subject to strict and systematic discipline but are protected from arbitrary action by the right to appeal to a higher level of authority.

In the context of controlling an organization, Weber identified three different types of leadership:

- the traditional leader who derived loyalty by virtue of his inherited status. Functionaries in his organization were personal retainers dependent on the master for reward;

- the charismatic leader who derived authority through his personal characteristics or from his status as a hero. Office bearers in this organization would be disciples of the leader; and finally

- the leader who derives his authority from legal, rational grounds. This was the type of leadership which combined most effectively with a professional bureaucracy.
  (Weber, 1984: 13-27.)

In Weber's view a bureaucratic organization structure was exemplified by a strongly hierarchical configuration, high formalization and centralization, pyramidal shape, and division of labour. His view of organizations was as mechanistic, rational, closed systems, and this was to exercise a very strong influence on the way in which subsequent theorists thought about organizations.

3.3 The Classical School

That there is a classical school of Organizational Theory is generally agreed. The issue in dispute is whom to include and whom to leave out. Some authors include Marxian class struggle and Michel's *Iron Law of Oligarcy* (Mouzelis, 1982: 487-491), while others include the Weberian ideal type bureaucracy. (Robbins, 1987: 478.) There is, nevertheless, consensus that the Classical School is best represented by the writings of Frederick W Taylor (1856 - 1915) and Henri Fayol (1841 - 1925).

Frederick W Taylor. Taylor (1984: 157-176) propounded a system which he called Scientific Management and which he summarized in four principles of management:

1. The development of a science to replace the "rule-of-thumb" knowledge of workers. This involved describing and collating each element of a worker's job and, with the assistance of time and motion study techniques, determining the single best method of carrying it out.
2. The scientific selection and progressive development of workers as a continuous process.
3. Bringing together scientific managers and scientifically selected and trained workers to accomplish work objectives with the scientific method.
4. A more even distribution of work between managers and workers, the former doing the planning and supervising and the latter the execution. Foremen should be specialists in a particular field, e.g. Quality or Maintenance, and should supervise several workers within this specialized field.

In total Taylor's writings offered little focus on the issue of structure except at the lowest organizational level. He also proceeded from a mechanistic, closed-system viewpoint with emphasis on the division of labour.

Henri Fayol. Whereas Taylor focused on shop floor management, Fayol (1984: 135-156) sought to develop more general principles of management which would be applicable to all levels of the organization. Proceeding from a basic bureaucratic orientation, he articulated his 14 general principles of management:

1. *Division of Work.* Drawn from the writing of Adam Smith; specialization makes workers more efficient and increases output.
2. *Authority and Responsibility.* Managers must be given the requisite authority to give orders. Along with authority comes responsibility and, to be effective, a manager's authority must equal his responsibility.
3. *Discipline.* Workers must obey the rules that govern the organization. Good discipline is an amalgam of clear understanding of the rules, effective leadership, and judicious use of sanctions and penalties.
4. *Unity of Command.* Every employee should receive orders from only one superior.
5. *Unity of Direction.* Organizational activities that have the same objectives should be under the control of one manager working to one plan.
6. *Subordination of Individual Interest.* The interests of any employee or group of employees should not take precedence over the general interest of the organization.
7. *Remuneration.* Employees must be paid a fair wage and, by means of bonuses and profit sharing, workers and junior management should have keenness and well-directed effort rewarded.
8. *Centralization.* The degree to which decisions are centralized with management, or decentralized to employees, is dependent on the demands of the situation. The question is to find the proper proportion of employee involvement in decision making.
9. *Scaler Chain (Line of Authority).* Communication should follow the scaler chain of authority from low level employees

to top management unless it creates unnecessary delays; in which case, and with the permission of all, direct communication between subordinates can take place provided that superiors are kept informed.

10. *Order.* People and materials should be in the right place at the right time, every time.
11. *Equity.* Managers should treat their subordinates in a kind and fair manner.
12. *Stability of Tenure of Personnel.* Management must plan its manpower needs and ensure that replacements are provided smoothly to fill vacancies. High labour turnover is inefficient.
13. *Initiative.* Employees who are allowed to originate and carry out plans will exert a high level of effort.
14. *Esprit de Corps.* Promoting team spirit will encourage unity and harmony in the organization.

The structural effects of Fayol's treatise can be seen mainly in the humanizing effect it had on machine bureaucracy. Some of his thoughts are quite at home at the cutting edge of modern organization and management theory. For example, profit sharing for workers and junior management, and employee participation in decision making, are both fairly modern structural innovations based on recent motivational and productivity research.

All in all, though, Fayol still proceeded from a point of departure steeped in bureaucratic concepts and based on a mechanistic view of an organization as a closed system with centralized decision making and division of labour.

3.4 The Human Relations School

A Study undertaken between 1924 and 1927 at the Western Electric Hawthorne Works in Cicero, Illinois, in the United States resulted in the documentation of the now famous Hawthorne effect; which

demonstrated that social and emotional factors - rather than changes to physical conditions - lead to variations in productivity and output.

The study was undertaken by Elton Mayo and a number of colleagues at Harvard University and it was expanded upon during the 1930s and 1940s. This group, later to become known as the Human Relations School, took a very different view of organizations and saw them primarily as social systems which fulfilled mainly social needs.

The impact on the understanding of structure of this group can be gauged by their concept of the informal organization that develops in the work environment, within and alongside the formal structure. It is this informal structure that ultimately determines the status and rewards of its members and creates norms and codes of behaviour by catering to the emotional needs of recognition, belonging and security.

Keller (1984: 193-203) highlighted the influence that the ideas of Italian engineer, economist and sociologist, Vilfredo Pareto (1848-1923), exercised on the human relations school. During the 1930s and early 1940s a small but very influential group of Harvard academics, under the leadership of Lawrence Henderson, gathered on a regular basis to consider the ideas of Pareto.

Against the background of worldwide depression and the growth of Marxism on university campuses, including Harvard, these academics saw the conservative teachings of Pareto as an ideological defence against radical Marxism. Most of them came from moneyed or privel-eged backgrounds and they had a vested interest in preserving the status quo. The Pareto Circle included some prominent names, among them Elton Mayo, Robert Merton and Talcott Parsons. The latter two were most often associated with the birth of the structural funct-ional school of sociology which was to influence the direction of organizational studies for the next three decades.

Henderson, who was a medical doctor, readily took to the views of Pareto who saw organizations as equilibrium seeking, closed systems, comprised of a number of subsystems. Each subsystem was evaluated by examining its consequence on other subsystems and on the system as a whole. Conflict was seen as inconsistent with a "healthy" system and stability and equilibrium were valued over change or conflict. (Keller, 1984: 196-197.)

These ideas, later extended and articulated as structural functionalism, no doubt exercised a great deal of influence on the way in which the Hawthorne studies were interpreted. One can only speculate as to the direction the Hawthorne study would have taken if, for example, the participants' approached it from an open systems viewpoint; or what the effect on organization theory would have been if the Pareto circle was based at a less prestigious institution than Harvard university.

3.5 The Contingency School

The contingency school grew, firstly as a response to both the classical and human relations schools, many of whose principles were seen as simplistic and nothing more than proverbs, which were often contradictory. Secondly, the contingency school recognized the influence that context and environment could have on an organization's structure. They saw organizations as open systems that needed to adapt and change according to the needs of the environment. Katz and Kahn (Robbins, 1987: 482) exemplified this view and they provided compelling evidence of environmental influence on the survival of organizations and as a major contingency in shaping structure.

Most empirical research in recent times has flowed from this approach as a number of studies investigated various contingencies. Woodward (1958: 4-21), for example, put together an impressive case for technology being the overriding structural imperative. This position was challenged by the Aston team (Hickson, Pugh &

Phesey, 1969: 378-397), who advanced the concept of size as being of greater importance.

The open systems orientation of the contingency school has led to much more flexibility in considering structural imperatives. The contribution of the contingency approach can best be summarized by its contention that there is *no one best way* to structure an organization. The final form that structure assumes will always be dependent on the contingencies that act on the organization in both its internal and external environments. (Galbraith, 1977: 28.)

As was mentioned in the first chapter, the orientation of this study is based on the contingency approach. It is the writer's opinion that it has the most to offer, particularly in the way of empirical research. In this respect, the work of the Aston group is particularly important and will be discussed in more detail later in this chapter.

3.6 The Dirty Linen School

The final school of organization theory, which Robbins (1987: 484) said is currently very much in vogue, looks at an organization in terms of the rivalry and conflicting goals of its political groupings. Structure is seen as the result of the struggle for power of various competing cliques within the organizational hierarchy. Intense political activity is disguised to appear as though it is in accordance with official policy and ideology. Self-serving activities are couched in terms that make them appear as though they are in the long term interests of the organization. The final structural configuration that the organization assumes is a product of the internal power struggles that have occurred and the dominant coalition's personal preferences and interests.

This approach completes the picture of organizational man as a rational decision maker on the one hand and as a social being seeking security and friendship, on the other, by adding a third dimension; political man - whose main interest is the pursuit of power. (Mouzelis, 1982: 495-496)

Although it provides a somewhat cynical and pessimistic view, it is nevertheless a useful perspective. That is, provided that it does not become exclusive and that the pursuit of political power is seen as only one of a number of possible contingencies or structural imperatives.

3.7 Summary.

Having very briefly traced the history of man's earliest organizational endeavours and then sketched the salient features of the five major approaches encapsulated in modern Organization Theory, the position has been reached where it is now possible to narrow the focus onto a particular body of research. With the application of an open systems orientation to the prevailing structural functional view of organization and structure, it was inevitable that the focus would shift from purely *a priori* theorizing to empirical research to match that which had been accomplished by the Hawthorne studies and its closed system interpretation.

Among the first to accomplish this was the Aston group in Great Britain whose work has been extended considerably and whose methodology was valid, reliable and still widely used today.

4. THE ASTON GROUP.

The Aston group started life as a four man team who came together in the early 1960's as the Industrial Administration Research Unit of the Birmingham College of Advanced Technology; later to become the University of Aston in Birmingham.

Working from a disused basement in a condemned office block some distance away from the main campus, the group, consisting initially of Derek Pugh, David Hickson, Bob Hinings and Graham Harding, pursued a line of research which, almost serendipitously, was to redefine the nature of Organization Theory in Great Britain and elsewhere in the world where their methods were replicated or extended in the 1970's and 1980's. The Aston work also exercised a considerable influence on the Organization Theory debate in the United States. (Grandori, 1987: xxi.)

The Aston group's initial terms of reference were to study factory worker performance and to establish how worker performance was influenced by contextual factors such as the size of the organization, its product and markets, and its control structure and technology. The ideas of Joan Woodward with respect to the effect of technology in determining structure were becoming very influential (Daft, 1983 : 162-165). The Aston research team soon realized that, while they could reasonably easily characterize and describe products, markets, size and - using Woodward's typology - technology, they had no effective way to categorize and compare organizational structure.

The issue of Structure aroused such interest in the group that they postponed their original research and concentrated instead on Organization Structure. "Structure itself became something to be explained." (Pugh and Hickson, 1976)

4.1 Point of Departure.

The Aston Studies were a seminal work and marked a major departure

from the individual case study methods of organizational research that were employed by the Human Relations and Structural Functional schools of Sociology, and the ideal type as a basis for the analysis of organizational structure as expounded by Weber.

Pugh and his colleagues criticized the popular management and administrative theorists of the time, which they believed were exemplified by Weber and Fayol, for being over concerned with the formal aspects of structure and functioning, or "organizations without people". Similarly, they were critical of empirically oriented behavioural scientists, exemplified by Mayo and Lewin, whose sole concern was informal group behaviour and attitudes - or "people without organizations". (Pugh, Hickson, Hinings, McDonald, Turner and Lupton, 1963 : 289-292). They were further critical of both these groups because their analyses had been processual rather than factorial. In other words, organization theories had been built around administrative system - or group interaction - *processes*, with little exploration of the ***causal connections*** between contextual factors and these administrative systems or group behaviours.

At the outset, Pugh and his colleagues made it clear that, for research to be meaningful, it had to be both processual and factorial, and that they were proceeding from a strong empirical bias. Their intention was not to build any more *a priori* theoretical models of organizational functioning.

Proceeding from thinking that was, nevertheless, steeped in Weberian concepts their first task was to isolate a number of typical and distinct elements that went into Weber's formulation of bureaucracy. They conceptualized 6 elements as being representative of structure. They maintained that by operationalizing and measuring these six variables they would be able to break away from considering organizations in terms of Weberian or neo-Weberian ideal types and would instead be able to establish an empirical, descriptive profile.

The six structural variables were :

- Specialization
- Standardization
- Formalization
- Centralization
- Configuration (Shape)
- Flexibility

In addition, they also postulated a number of contextual elements which were exogenous to the organization and could be regarded as independent variables exercising a causal effect on the dimensions of structure. These they identified as the organization's origin and history, its ownership and control, its size, its charter, its technology, its location and resources, and, finally, its interdependence with other players in its domain. (Pugh et al, 1963: 301-313.)

The Aston group's initial hypothesis that the form an organization's structure finally assumes is largely contingent on contextual and environmental factors - and that there is, therefore, no one ideal way to structure an organization - anticipated by several years what was to become known as Contingency Theory; which was to form the most useful and popular theoretical framework for organizational studies in the 1970s and 1980s. (Hodge and Anthony, 1984: 40-41.)

4.2 The Aston Study.

Data were gathered from a total of 52 organizations in the English midlands over a two year period from 1962 to 1964. The result was a random sample of 46 organizations, stratified by size and product or purpose. The sample included manufacturing, retail, service, municipal, and government organizations. (Pugh, Hickson, Hinings and Turner, 1968 : 67)

A number of papers arose out of the data that were gathered and treated in the initial exercise and more than 10 years later the raw data were still being manipulated to extract fresh nuances of meaning. (Donaldson, Child and Aldrich, 1975)

Understandably, the initial emphasis was on methodology. (Pugh et al, 1968) This is hardly surprising as it was the first study of its type and scope to be attempted; going far beyond the unidimensional approach of Woodward and others. Five of the original dimensions of structure were operationalized. The sixth dimension, flexibility, was excluded because, by definition, it was longitudinal in nature and would be difficult to measure in a cross-sectional study.

Altogether, 64 scales were developed to measure the primary dimensions of structure. A factor analysis, employing principal component analysis, was used to reduce the raw data to four clusters of underlying dimensions. These were then labelled:

(i) ***Structuring of activities;*** referring to "the degree to which the intended behaviour of employees is overtly defined by task specialization, standard routines, and formal paper work." (Pugh and Hickson, 1976 : 78) This included the structural variables of functional specialization, role specialization, overall standardization, and overall formalization.

(ii) ***Concentration of authority;*** which referred to "the degree to which the authority for decisions rests in controlling units outside the organization and is centralized at the higher hierarchical levels within it." (Pugh and Hickson, 1976 : 78) This cluster of underlying dimensions encompassed the structural variables of centralization, organizational autonomy, and standardization of selection and promotion procedures.

(iii) *Line control of workflow;* described as "the degree to which control is exercised by line personnel instead of through impersonal procedures." (Pugh and Hickson, 1976 : 78) Variables included here were of the ratio of subordinates, formalization of job performance records, and the percentage of workflow supervisors.

(iv) *Relative size of the supportive component;* which is concerned with "the amount of auxiliary activities of a non-control kind" (Pugh et al, 1968 : 87) The structural variables measured here included the percentage of clerks, the percentage of non-workflow personnel, and the vertical span or height of the organizational structure.

Using the above factor combinations, the Aston researchers were able to construct profiles of various organizations once the scores had been standardized. In order to achieve comparability the raw scores were standardized with a common mean of 50 and a standard deviation of 15. This enabled not only a meaningful comparison of similar factors between organizations but also of disparate factors within organizations.

The variability of the structural dimensions across organizations that was thus illustrated had immediate implications for what the Aston team termed the Weberian Stereotype. "It is demonstrated here that bureaucracy is *not* unitary, but that organizations may be bureaucratic in any number of ways...the concept of the bureaucratic type is no longer useful." (Pugh et al, 1968 : 88)

4.3 Classifying Organization Structure.

The Aston team also attempted to put together a fairly basic and

simple taxonomy of organization structures based on three of the four underlying dimension clusters, i.e. structuring of activities, concentration of authority, and line control of workflow. (Pugh et al, 1969b.)

Tentatively, they identified seven distinct organizational classifications and then compared these with the contextual variables of Size, Technology, Dependence, and Ownership. The results are summarized in table 2.1.

	STRUCTURAL DIMENSIONS			*CONTEXTUAL VARIABLES*		
Organization Type	*Structuring of Activity*	*Concentration ofAuthority*	*Line Control ofWorkflow*	*Size*	*Workflow Integration of Technology*	*Dependence*
Full Bureaucracy	*H*	*H*	*M*	*M*	*L*	*H*
Nascent Full Bureaucracy	*M*	*H*	*L*	*M*	*M*	*H*
Workflow Bureaucracy	*H*	*M*	*M*	*H*	*H*	*H*
Nascent Workflow Bureaucracy	*M*	*L*	*L*	*M*	*H*	*M*
Preworkflow Bureaucracy	*L*	*L*	*L*	*L*	*H*	*L*
Personnel Bureaucracy	*L*	*H*	*H*	*M*	*L*	*H*
Implicitly Structured Organization	*L*	*L*	*H*	*L*	*L*	*L*

KEY: H = Standard score higher than 55
M = Standard score of 45 to 55
L = Standard score less than 45

Table 2.1. **Definition of Structural types in terms of Standard Scores on Structural Dimensions and Contextual Variables.**

Based on this analysis, the Aston team were able to postulate 7 basic organizational typologies:

- Their was only one ***Full Bureaucracy*** and it was characterized by high scores on structuring of activities and concentration of authority. It had a high dependence score, probably because it was government owned, and a low score on workflow integration because it was only a maintenance and repair function.
- The ***Nascent Full Bureaucracy*** possessed much the same characteristics, although not to the same degree.
- ***Workflow Bureaucracies*** had high scores on structuring of activities while the relative scores on the other two structural dimensions were comparatively lower and fell within the Medium range. This group contained the largest organizations in the Aston sample and had the highest scores on workflow integration of manufacturing industries - indicating a high degree of automaticity and rigidity in the manufacturing process.
- ***Nascent Workflow Bureaucracies,*** again, showed much the same characteristics, but not to the same degree.
- ***Preworkflow Bureaucracies*** scored a lot lower on structuring of activities and showed typically workflow bureaucracy characteristics of dispersion of authority and impersonal line control. They were smaller in size than nascent workflow bureaucracies and were much more independent, as indicated by the high scores for concentration of ownership with control.
- ***Implicitly Structured Organizations*** had low structuring of activities, dispersed authority and high line control. They included the smallest organizations in the sample and scored low on workflow integration, indicative of a more entrepreneurial and organic structure. They were relatively independent with high scores for concentration of ownership with control.

- *Personnel Bureaucracies,* although very similar to implicitly structured organizations in terms of low scores on structuring of activities and high scores on line control, nevertheless differed sharply on concentration of authority. Read together with their high scores on dependence and low scores on concentration of ownership with control, it was typical of the organizations in this cluster; namely, government or municipal organs whose ultimate controlling group was always above and outside the organization itself.

A developmental sequence was suggested and this is apparent in the terminology used to describe the various types of structure. As an organization develops and grows in size, looking specifically at the dimensions of structuring and line control, it was possible to see an increasing amount of structuring and a decreasing amount of line control as it progressed :
from *Implicitly Structured* - small size, hands-on control, flexible technology,
through *Preworkflow* - less line control, more staff control,
then *Nascent Workflow* - first appearance of specialists, growth of structural and procedural controls,
and, finally, *Workflow* bureaucracy - with its reliance on specialists, formalized procedures, and control through impersonal, bureaucratic regulation. (Pugh et al, 1969b : 123-124.)

The same sequence of events would apply to the development of nascent full bureaucracies into full bureaucracies.

The Aston Group's empirical taxonomy of structures and its concomitant developmental sequence again debunked the Weberian ideal type. It also anticipated the concept of an organizational life cycle, popular in management literature of the 1980s.

4.4 The Technological Imperative.

The final task that the Aston team undertook was to re-examine the Technological Imperative of structure, which had been given great prominence as a result of the work of Joan Woodward. (1958: 4 - 21.)

In contrast to Woodward's three-fold classifications of technology, the Aston researchers devised a single, overall variable which they called *Workflow Integration* and which was an amalgam of the

- automation of equipment,
- adaptability of workflow,
- evaluation of operations, and
- unit of throughput

of the organization's technology. (Hickson, Pugh & Pheysey, 1969: 378 - 397)

Taken as a whole, the team's findings both confirmed and conflicted with Woodward's findings. Most importantly, they could find no support for the broad Technological Imperative hypothesis that technology was of primary importance to structure. They concluded instead that "...it is size that is overwhelmingly related to structuring of activities." (Hickson et al, 1969: 388.)

They did conclude, however, that their differences with Woodward's study were not irreconcilable - especially if size was introduced as an independent variable and technology was confined to those structural variables related directly to workflow. In other words, technology could be of overriding structural importance in a small company, or near the operating core of a large company. "The smaller the organization, the wider the structural effects of technology; the larger the organization, the more such effects are confined to particular variables, and size and dependence and similar factors make greater overall impact." (Hickson et al, 1969: 395.)

The Aston standpoint on the Technological Imperative was challenged by Aldrich (1972, 26 - 43) who applied a different statistical model (path analysis) to the Aston data. He maintained that different outcomes or causal relationships could equally well fit the Aston data and correlations. He also criticized the Aston methodology for its apparent lack of consideration of reciprocal causality and feed-back loops. His path analysis model suggested that technology actually preceded both structure and size - so the causal chain was in fact

technology ▸ structure ▸ size.

In replying to Aldrich, Pugh and Hickson (Van Niekerk, 1979: 143) emphasized that their data were cross-sectional and their study was only aimed at establishing relationships and possible predictions. No claims could be made for causality. Similarly, no causal links could be inferred via the path analysis model because the data were cross-sectional.

In an early replication of the Aston study, Child (Child & Mansfield, 1972: 371) further developed the caveat attached to the cross-sectional nature of the data. Firstly, the data were gathered in a much shorter time period than it would take any of the variables being measured to actually change. Organization change is, by its very nature, slow and incremental. Secondly, cross-sectional data would be referring to *simultaneously occurring* values of different variables and, again, one would expect the process of causality to take time. It would not be reasonable to expect that technology, size or structure could change instantaneously. (Child and Mansfield, 1972: 391.)

4.5 The National Study.

The study by John Child (1972: 163-177) was the first large scale replication of the Aston work and was undertaken by the London

Graduate School of Business Studies. Child took pains to replicate as exactly as possible the Aston methodology, using the interview schedules provided by the Aston team and ensuring that his own research assistants were trained by the Aston group.

Child's sample differed from that of the Aston team in five important respects:

1. It included more than just one region of Great Britain - hence it became known as the National study.
2. As far as possible the sample was confined to whole units and did not include any sub-units of larger organizations.
3. It was confined to business organizations and excluded civil service and local government organizations.
4. The sample was stratified by size and confined to only six industries, 4 manufacturing and 2 service.
5. The size of the sample was considerably larger, 82 organizations as opposed to Aston's 52.
   (Child, 1972: 165)

The biggest difference in the raw scores of the structural dimensions measured by the two studies occurred on the dimension of centralization, where the National mean was less than the minimum actual score on the Aston sample. Child felt that this difference could be accounted for because Aston had included branches in its sample and decision making within a branch would seem to be more centralized; whereas the National study saw branch decisions as decentralized and occurring at a lower level.

In contrast to the Aston studies the National study also came up with a negative correlation between centralization and rules (standardization) and paperwork (formalization). This, it was felt, could well be a reflection of the greater homogeneity of the National sample in terms of status. Most of the rules and procedures of standardization and formalization would be evident in branches and subsidiaries, and the National sample excluded branches.

For Child, the correlation between decentralization and bureaucratic control measures of formalization and standardization implied a strong measure of strategic choice. Thus an early salvo in the argument about the strategy/structure causal link was fired.

Child (1972: 175), therefore, queried the discarding of Weberian concepts by the Aston team as his findings actually supported Weber's description of decision making and decentralization in a bureaucracy. Nevertheless, Child did find strong support for the Aston assertion of a nexus between specialization, standardization, formalization, and vertical span.

Child also called into question the Aston taxonomy of structures since some doubt had been cast on the second group of underlying factors relating to centralization, which formed one of the axes for Pugh *et al's* analysis.

However, Donaldson (1975: 453-456) later revisited the Aston data and this time he controlled it for status and government organizations which were highly centralized. The upshot was that the controlled Aston data still had a mean centralization score considerably higher than the National figure. Donaldson concluded that, "the Aston results cannot be explained away as an aberration produced by inconsistent measurement across units having different organization status. And the resolution of this puzzle needs to be looked for elsewhere." (Donaldson, 1975: 455-456.)

In another examination of the National data, Child and Mansfield (1972: 369-393), proceeding from an open systems perspective, looked afresh at the Technology, Size and Structure link. They made the point that the findings of Woodward and her colleagues were not inconsistent with those of the Aston and National studies. They were, in fact, measuring different aspects. In measuring structure, Woodward had described the 'shape' of an organization while the Aston and National studies had been more concerned with structural

variables which described strategies of control. They concluded that the results of the Aston and National studies, taken together, refuted any argument for technology as the single most important structural imperative. (Child & Mansfield, 1972: 388). They did concede, as did Hickson *et al* (1969), that technology played a part near the operating core and in smaller organizations.

Another re-examination of the National data led Child (1973: 168-185) to focus on the linkage between size and formalization. His conclusion was that complexity, as defined by role and functional specializations together with the level of specialist qualifications, should be introduced as an intervening variable. In other words, the correlation between large size and high formalization was not as powerful as the relationship between large size and increased complexity on one hand, and then complexity and formalization, on the other. An unpublished reanalysis of the original Aston data supported the size-complexity-formalization configuration obtained in the National study.

4.6 The Value of the Aston Work.

Although the Aston work has been criticized on methodological grounds, it has also been widely acclaimed for the manner in which it operationalized abstract theoretical concepts, developing scales and measuring instruments which made possible numerous replications. The Aston team saw their own contribution in terms of a break with Weberian ideal types and a transition from *a priori* to empirical theory based on an open systems orientation. They set objectives to identify, describe and measure the dimensions of structure and to consider the influence of context or environment. There can be little doubt that they succeeded. The extent of their success can also be judged in the growth of a body of contingency theory with a strong empirical bias.

Studies of context and structure using the Aston scales have been made in the UK, USA, Canada, Sweden, West Germany, Poland, Jordan, Egypt, India and Japan. They have also been made across manufacturing, service, government, hospital, educational, religious and trade union organizations (Pugh & Hinings, 1976). As a package, the Aston studies represented a sustained approach to the study of organizations. Its methods were based on a two-pronged thrust. Firstly, its approach was multidisciplinary and broad-based, encompassing as many variables as possible; and, secondly, its methodology was systematic and deliberately designed so that others could use it and adapt or improve on it. (Hickson & McMillan, 1981.) In a critical, replication Grinyer and Yasai-Ardekani (1980: 405-421) demonstrated the adaptability of the Aston methodology on a sample of 45 electrical engineering firms in south-east England. The CUBS study, as it became known, found broad support for all the main findings of the Aston and National studies.

The adaptability of the Aston methodology has meant that it has not dated and it was still in widespread use during the 1980s.

5 ASTON : EXTENSIONS, REPLICATIONS AND VARIATIONS.

After the initial study carried out on the Birmingham sample and the published work that flowed from it, a number of replications, extensions and variations followed. The work of the Aston group invoked widespread interest and comment - not least because their methodology was so clearly spelled out and explicit that it was easy to follow; and also easy to criticize. One of the major problems associated with their method was the prohibitive cost of gathering data (Grinyer & Yasai-Ardekani, 1981: 288). The interview schedules and measuring instruments were so comprehensive that it could take from five hours to several days to elicit data from one respondent, depending on the size of the organization.

5.1 The Coventry Study.

The first replication of the Aston study was a small scale repeat under similar conditions. The prime objective was to establish the limits of the original predictions and correlations. (Hinings & Lee, 1976: 3-11.)

The same measuring instruments were used on 9 manufacturing organizations in the electrical goods sector of industry in Coventry in the United Kingdom. By restricting the sample to the same general product group, it was hoped that the effects of technology would be controlled. In order to assure compatibility, comparisons were made only with the 31 manufacturing organizations in the original Aston sample. The methodological care taken by the original team was reflected in the ability of fresh interviewers to take over complete interview schedules with little difficulty.

The results of the Coventry study showed a strong correlation between specialization, standardization and formalization - the component variables for the dimension Structuring of Activities. Centralization showed a significant and negative relationship to specialization and standardization, while structuring of activities exhibited a strong positive relationship with size. Centralization was positively related to the contextual variable of dependence.

All in all, the results were generally in accord with Pugh *et al* (1968 & 1969b). Some attempt was made to control for the effects of technology and dependence and this seemed to indicate that the effects of size on structure was more pervasive and applicable to a wider range of organizations than was first thought.

5.2 An Abbreviated Replication.

The problem of the volume of data required by the Aston methodology

was addressed by Inkson, Pugh and Hickson (1970: 318-329) who developed an abbreviated schedule. Their sample consisted of 40 organizations drawn from the same population as the original Aston study, i.e. organizations with 250 or more employees situated in the Birmingham area. Their hope was to further encourage the development of a widely used instrument for organizational assessment comparable to the psychological test batteries available for individual assessment. They were mindful too of senior managers in organizations becoming resistant to collaboration in research which they perceived to be non-essential.

With these considerations in mind, they reduced the schedule to encompass 2 contextual variables, apart from size, and 2 structural variables. These were:

Context

Workflow Integration	-	encompassing technology and the degree of automated, continuous, fixed-sequence operation.
Dependence	-	the relationship with owners, suppliers, customers and other organizations in the organization's task environment.

Structure

Structuring of activities	-	the degree of specialization and formalization.
Concentration of authority	-	autonomy, locus of decision making, and the degree of centralization.

An item analysis was carried out using the same methods developed

in the original study, and the results indicated very high coefficients of unidimensionality. The revised schedule now took, on average, about one hour to complete and, despite the much shorter time, the indications were that the measures obtained were reliable.

The results showed a markedly similar patterns to those of the original study, suggesting stable, recurring organization phenomena in the population that was studied. (Inkson et al.,1970: 321-322)

Ten of the 40 organizations in the sample were also present in the original Aston sample and so the opportunity for longitudinal study of organizational characteristics was presented. It was found that the contextual variables were little changed. There was, however, a tendency for structuring scores to increase over time, and for centralization to decrease.

Plotted on a graph whose axes were labelled: structuring of activities and concentration of authority, the same four basic typologies of organizations emerged as had been identified by Pugh *et al*(1969b), indicating dimensions that were concerned with stable, meaningful structural relationships. The developmental sequence proposed by Pugh *et al*(1969b) was also supported. Structuring increased in all the organizations, except one where it remained constant, and centralization declined in most of them.

Paradoxically, changes in structure were not correlated to changes in size, which was in sharp contrast to the large correlation in the original study between size and structure. This suggested a ratchet effect in that an increase in size brings an increase in structuring but a decrease in size is not accompanied by a concomitant decrease in structuring. An assertion that is not at odds with Parkinson's law.

The reliable short form measure that was established was frequently

used in many studies thereafter. Full details were supplied by the Aston researchers and its use was encouraged.

5.3 Applications in Non-commercial Organizations.

A number of studies were carried out in non-profit, religious, educational, political and voluntary organizations.

In an analysis of 81 government departments, Greenwood and Hinings (1976: 87-101) looked to test whether the existence of an elected official was regarded as a major structural contingency for a government bureaucracy. Almost surprisingly, this was found not to be the case. The British civil service had a strong managerial ethos which permeated government departments and which transcended political factors to the extent that continuity was preserved and political realignment exercised only a minor influence. This, of course, was consonant with the ideas of Weber and the strength of rational leadership in a professional bureaucracy. The structure of Government bureaucracies was generally consistent with the Aston findings.

The educational sector in the Canadian provinces of British Columbia and Alberta was the subject of a study by Holdaway, Newberry, Hickson and Heron (1976: 115-135). Their sample consisted of 23 colleges and tertiary institutions. Using the Aston methodology, the researchers constructed a number of contextual and structural variables. Factor analysis then reduced the structural variables to only two: bureaucratic control, and administrative configuration. Relating these to contextual variables, it was found that public control was linked to bureaucratic control, while larger size was tied to a greater administrative hierarchy. This meant that a large publicly controlled technical institute had both bureaucratic control mechanisms as well as a large administrative hierarchy, while a small private college had neither.

Looking at a sample of eight occupational interest associations comprised of 7 trade unions and 1 professional association, Donaldson and Warner (1976: 67-86) found fundamental relationships with respect to size, structuring and centralization to be similar to those of the Aston study. They did, however, find greater centralization. They also introduced a variable to measure the democratic aspects, which they called electoral control, and which they found was negatively correlated with structuring of activities. Apparently, less formalization was offset by the greater amount of centralization.

A small scale study of nine church organizations drawn from the Roman Catholic, Methodist, and Anglican denominations was also carried out. (Hinings, Ranson & Bryman, 1976: 102-114). The same structural variables were used, while new contextual variables were developed. The results differed significantly from the Aston work. Specialization, standardization and formalization were not highly correlated and so it was not possible to speak of an overall dimension of structuring of activities. Centralization and lack of autonomy were also not related and size, while significant, did not have the overall pervasive effect. The strongest contextual imperatives were found to be belief structure and membership characteristics. This lead the researchers to conclude that, "Structure in churches is, in itself, the embodiment of a belief." (Hinings et al, 1976: 114.)

5.4 Climate and Group Level Studies

The second generation Aston researchers also attempted to relate structure to different levels of analysis within the organization. Virtually all of the early research was concentrated at the macro-organizational level, with little or no effort directed at group or individual levels within the organization.

Pheysey, Payne and Pugh (1971: 61-73) examined the effects of mechanistic (bureaucratic) structures on groups in terms of the groups' structure, performance and climate. They isolating two smallish organizations of similar size and product processes, but otherwise as different as possible. One was mechanistic and bureaucratic with high structuring of activities, while the other was more informally structured, entrepreneurial and organic. The research team then examined three groups from each organization : senior management, middle management and first line supervisory.

They found that a mechanistic structure was positively related to lower task complexity at lower levels of the organization, while there was also more formalization at group level and less group autonomy and more external pressure on groups in a mechanistic structure. The researchers also found that some of these relationships could be compensatory in that an organization with a high score on bureaucratic control could still produce a stimulatory and progressive climate if other aspects of its structure supported human resource developmental systems, for example performance management and career planning systems. It was also found that decentralization and bureaucratic control at lower levels freed management to deal with complex and innovative tasks. The modifying effect of other intervening factors was also stressed by Payne and Pheysey (1971: 261-284) who used the technique of sociometric nomination to relate communication and group interaction to aspects of structure in organizations.

Looking specifically at organization climate, Pheysey *et al*(1971) found that a mechanistic structure scored higher on aspects of questioning of authority, future orientation, scientific technical orientation, intellectual orientation, job challenge, industriousness, altruism, rules orientation, administrative efficiency, conventionality, and readiness to innovate. It scored lower on the perception of the leader's psychological distance and orientation to the wider community.

When the contextual variable of size was introduced by examining data from a much larger bureaucracy it was found that these trends were still present and were more pronounced. (Payne & Mansfield, 1973: 515-526.)

5.5 Cross-cultural Comparisons.

The acceptance of the Aston methodology sparked a number of studies in many countries across the world. Some of these will be examined in section 7 which will cover Organization Theory in developing countries. Discussed below are three cross cultural comparisons.

Using data on 70 organizations in Great Britain (Birmingham), Canada (Toronto) and the United States (Ohio), McMillan, Hickson, Hinings and Schnek (1973: 555-569) found that large organizations in similarly industrialized nations exhibited similar bureaucratic features. An exception was the dimension of formalization in the United states which tended to score significantly higher than comparable organizations in Great Britain. A possible cultural explanation for this phenomenon was advanced which related to the traditionalism in both countries. Whereas the United States has a codified constitution and rules and laws which permeate all levels of society, the United Kingdom is far more reliant on its tradition of correctness, and genteel good manners. One should *know* what's right, old Chap - there's no need to write it down!

Another investigation, using the same data, found support for the relationships between contextual variables, notably size, and structure, especially formalization and specialization. This inferred that these relationships will hold in all societies in that the link between the contextual variables and structure will be of similar magnitude and in the same direction. In other words, South African organizations may turn out to be less

autonomous than American ones, but bigger South African organizations will still be more formalized than smaller South African ones, and dependent South African organizations will be less autonomous than relatively independent ones. (Hickson, Hinings, McMillan & Schwitter, 1974: 59-80)

A similar cross-cultural study (Horvath, McMillan, Azumi & Hickson, 1976: 60-86) was carried out, this time using data from 36 manufacturing firms from Britain, Japan and Sweden. Twelve matching sets of three companies sorted by product line, and controlled for branch, principal or subsidiary status, were created. General support for the stability of the context-structure relationship across cultures was found, with differing nuances of emphasis. One important difference to earlier studies was that technology (measured as automaticity) was found to be positively correlated to centralization. A possible interpretation of this result postulated that no differentiation had been made on the nature of centralized decisions. Organizations were quite happy for routine, operative decisions to be governed by bureaucratic controls and to be decentralized and automated, but strategic decisions still had to be centralized and made at the top.

5.6 Summary.

This section concludes the second of the two sections of this study that are devoted exclusively to the work of the Aston group and the second and third generation Aston researchers. The impact that the Aston methods have had on Organization Theory has been enormous and enduring. Pugh (1988: 123-135) summarizes the contribution of the Aston programme as:

(i) the development of a useful heuristic framework of stable, meaningful organizational variables enabling reliable and valid comparative measures to be made,

(ii) at the macro level of analysis the relationship between context and structure has been sufficiently consistent to warrant a predictive approach,

(iii) at the group level relationships, although less clear, have been established between objective structure measures and perceptual climate measures, and

(iv) the Aston programme has been a major factor in the development of the contingency approach to organization theory.

There are, nevertheless, criticisms that can be levelled at the Aston research and its findings. The Aston team's view of an organization was very passive, static and almost helpless - the organization was pushed and pulled by context or environment and there was little or no consideration for strategic choice or power control as powerful structural contingencies.

Contextual configurations, while important, are not necessarily overriding. Adaptations in response to contextual change do not occur spontaneously. Some kind of intervening variable, be it strategic choice, or whatever, is necessary. In the words of Ford and Hegarty (1984: 272), "...the structure-contingency perspective does not explain the process(es) or mechanism(s) through which (environmental) factors are translated into structure or better performing alignments evolve."

Insofar as the methodology is concerned, Grinyer and Yasai-Ardekani (1981) detailed some of the problems that they encountered, mainly in connection with costs and manipulation of the data. Nevertheless they concluded that, "Used with care the...scales have been found useful and permit a high degree of consistency and prediction."

In his essay on assuming the editorship of the *Administrative Science Quarterly* in 1986, John Freeman commented that the Aston research was one of three major milestones in organizational studies. The other two were the Hawthorne and American Soldier studies. (Bryman, 1988: 6.)

CHAPTER 3. REVIEW OF THE RELATED LITERATURE AND RESEARCH : CURRENT PERSPECTIVES.

1. INTRODUCTION.

A library search conducted for this study, using the key words Organization, Theory, Structure, and Design, singly or in various combinations, elicited a mountain of references to published work. Unfortunately, a great deal of it fell into the category of armchair theorizing and not a lot of it was usable. It also seems that there is a good deal of enmity between academics from different institutions and from different schools of thought. This aspect will be pursued further in sections 7 and 8 of this chapter when the views of Donaldson (1985 & 1988) and others will be discussed.

The ongoing debate in the Strategic Management literature regarding the strategy/structure causal relationship continues to favour the 1962 viewpoint of Chandler (Galbraith, 1977: 87-88) and Child (1972a) that structure follows strategy. Porter (1985), for example, sees structure purely in terms of facilitating the linkages on a company's value chain; accordingly, he believes that an organization's structure should be designed with this purpose in mind.

Turning to the published literature on Organization Theory, on the other hand, it becomes apparent that there is a groundswell to a more eclectic approach and, at the same time, many of organization theory's accepted truths are being re-examined. This chapter will outline some of these re-examinations, looking firstly at the basic points of departure of organization theory, before moving on to highlight recent research findings on structural imperatives. The contributions from other disciplines will also be discussed and a look will be taken at high technology organizations. A summary of Organization Theory perspectives that are drawn from developing countries will be presented. Finally, the major critics of classical Organization Theory will be considered and a framework for reconciling the divergent views of the major debates in Organization Theory will be suggested.

2. POINTS OF DEPARTURE REVISITED.

It is generally accepted that modern organization theory is underpinned

by the principles of systems theory and structural functionalism. These perspectives are discussed below, but first the basic building blocks of scientific theory will be discussed.

2.1 A problem with Words.

In a philosophical, almost esoteric, discourse Sandelands and Drazin (1989: 457-478) threw cold water on the popular language used by organizational theorists to describe the salient features of their discipline. Sandelands and Drazin observed that most organizational theorists tackled the problems of organizations from a Parsonian structural-functional perspective and the central debate in organization theory has been between environment and strategic choice. The question to be addressed is: are organizations shaped by forces in the environment including natural selection (Exogenetic theories), or are they shaped by the actions and choices of managers inside the organization and the processes flowing from these actions and choices (Endogenetic theories). Both theories are based on the weaknesses of the other; i.e. strategic choice proponents do not believe that the environment is capable of accounting for all of structure, while environmentalists believe that organizations are subject to inertial pressure which resists strategic choice. Sandelands and Drazin (1989) maintained that neither perspective has been successful in explaining organizations.

They believed that the problem is associated with the words that are used to describe the theories. They drew a distinction between action verbs and achievement verbs; for example, 'running' and 'key-turning' are task verbs that refer to actual processes. 'Winning' and 'unlocking' are achievement verbs that refer to outcomes that running and key-turning can have. Organization theory is riddled with achievement verbs and scant attention is ever paid to the processes that lead up to the final outcome.

This emphasis on outcomes is, of course, common practice in contingency theory. "Theorists...do not concentrate on the causal bases of structure in organizations. They ask what structures are appropriate...rather than what structures are generated by certain situations." (Hartman, 1988: 18.)

Apart from questioning the words used by organization theorists, Sandeland and Drazin (1989) also called into question the logic used by both endogenetic and exogenetic theorists. Regarding the latter, they questioned the logic of explaining the organization by everything that is *not* the organization, i.e. the organization's environment.

Similarly, they had a problem with the concept of a strategic élite which makes strategy, but at the same time is made by strategy.

Nevertheless, both the endogenetic and exogenetic theories remain compelling, despite problems with their words. Sandelands and Drazin (1989) believed that the problem is not with the empirical research that has been carried out, which remains valuable. Rather, they felt the problem lies with the way in which the findings have been interpreted. They spoke strongly for methods of longitudinal process analysis, and generalizations based on observed behaviour, and not on consequences. In other words, they emphasized longitudinal studies rather than cross-sectional studies. The former will generate action verbs and descriptions of process, while the latter will generate only achievement verbs and an appearance of process.

While the sentiments of Sandelands and Drazin (1989) are admirable, it is felt that with the time and cost restraints faced by most organizational researchers, it would be difficult to abide by them in most instances. Nevertheless, it is as well to be aware of the pitfalls of cross-sectional research and to make an effort to describe and evaluate the process as well as the outcomes. This

point was made forcefully by the original Aston researchers who spoke of the need for organizational research to be both *Processual* as well as *Factorial.* (Pugh et al, 1963)

2.2 The Systems Paradigm: Another Look

Most modern organization theory - particularly contingency theory - claims to be based on the open systems paradigm. (Ford et al, 1988; Hartman, 1988; Robbins,1987; Daft, 1983 etc.) It also proceeds from thinking imbued with the concepts of structural functionalism. This was the original extension of the properties of living systems to organizational and social phenomena, propounded by Talcot Parsons (1967) and others in the 1940s and 1950s (McGee, 1975). The structural functional school has been mentioned several times in this study and it would probably be instructive at this point to digress briefly to consider the main features of this theoretical approach.

The point of departure for structural functional analysis is the question: how are societal structures carried forward despite the complete turnover of their individual members with every new generation? The answer to this question lies in structural functionalism's basic assumptions. These are set out below.

Interdependence. The normal operation of one social phenomenon is usually dependent on the normal operation of another. In other words, the structural components of a system or organization are dependent on each other for the smooth operation of the total system or organization as a whole. There is a pattern and order to be found in the interdependence of a social system's various components.

Interaction. The continued harmonious interaction of the compon-

ents of a social system are responsible for the continued working and survival of that system. The term 'interaction' implies an ongoing process - social behaviour occurring in closed circuits of action and interaction - and the action of each component is related to a corresponding action of another component. Rather like the workings of a well-oiled machine, or more accurately, like the workings of a living, biological system.

Integration and Equilibrium. Interdependent and interacting social phenomena cannot occur without a high degree of integration and the maintenance of equilibrium. If all such phenomena are integrated and constantly seeking equilibrium, the implication is that all social events are functional to some extent - even if this function is negative.

Consequence. It becomes apparent, then, that the full significance and implications of a social structure or event can only be comprehended when its ***consequence*** is considered - or when the consequences that, in turn, produced it are considered. In other words, the understanding of social phenomenon is dependent on the comprehension of its function, or of the function that was the determining factor in bringing it about. Events and structural components which are functional can be regarded as having been created by the system, as well as playing a part in the maintenance of the system. Most, perhaps all, of social behaviour is functional. Sometimes the function is not readily apparent and, until a social phenomenon can be shown to be systems-created and systems-maintaining, it has not been fully explained functionally. (McGee, 1975: 240-242.)

Survival. Certain basic tasks must be performed if a system is to continue. Thus the actions of certain subsystems and components are not only dependent on each other but have the important function of the preservation of the system as a whole. The basic universality and broad similarity of different organizations and systems can be explained functionally. The functional requisite of

survival is responsible for certain kinds of social action in every system to ensure the continuance of that system. Ultimately, success is judged by only one criterion - survival. (Hodges, 1975: 58-59.)

According to Parsons (1967), an organization has four basic problems to overcome. They are summarised in Table 3.1.

	ORGANIZATION CHALLENGE		IMPLICATIONS
1.	Adaptation		the way an organization must adapt to its social and non-social environments.
2.	Goal Attainment	-	every organization must marshal its resources to attain goals through cooperative effort of its subsystems.
3.	Integration	-	integration of all its component parts to legitimate authority and develop regulative norms.
4.	Pattern Maintenance	-	maintaining cohesion and order by internalizing norms and values and regulating tension.

Table 3.1. Structural Functional Organization Challenges.

Again, success in resolving these basic organizational problems can be evaluated in only one way - the survival of the organization. (Parsons, 1967.)

Turning now to focus specifically on the open systems approach, in recent times, so went the argument of Ashmos and Huber (1987: 607-621), the emphasis in organization theory has shifted away from the systems paradigm as a point of departure. They argued cogently that such a move is premature and that the full value of the systems paradigm has not been exploited. They also believed that organizational theorists have been functioning under two misconceptions.

Firstly, there is a mistaken impression that the early, classical theorists, for example, Weber, Taylor and Fayol, proceeded from a closed systems perspective. Although the early theorists did not use the terminology that is in vogue today, the evidence

	PROPERTY	IMPLICATIONS
1.	Importation of Energy	Open systems import energy from the external environment.
2.	Through-put	Open systems transform the energy available to them.
3.	Output	Open systems export some product into the environment.
4.	Systems as Cycles of Events	The pattern of activities of the energy exchange has a cyclic character.
5.	Negative Entropy	To survive, open systems must move to arrest the entropic process.
6.	Information Input, and	Inputs furnish signals to the structure about the environment and about its own functioning in relation to the environment.
	Negative Feedback	Negative feedbacks enable the system to correct its deviations from course.
7.	Steady State, and	The importation of energy to arrest entropy operates to maintain some constancy in energy exchange.
	Dynamic Homeostasis	At more complex levels the steady state becomes one of preserving the character of the system through growth and expansion.
8.	Differentiation	Open systems move in the direction of differentiation and elaboration.
9.	Equifinality	A system can reach the same final state from differing initial conditions and by a variety of paths.

Table 3.2. Properties of Open Systems (From: Ashmos and Huber, 1987.)

abounds that they recognized the role of the environment. Modern theorists often use simplified models which do not include critical aspects of the environment - does this then imply closed systems

thinking? A model, by definition, is a simplification and is, therefore, flawed. "The matter is straightforward - there is a difference between (a) believing that organizations are closed systems and (b) using closed systems models...(to analyse organizations)." (Ashmos & Huber, 1987: 609.)

The second widely held misapprehension is that open systems theory has guided organizational research. Ashmos and Huber (1987) believed that this is true only to a limited extent; for example, with respect to properties 6 and 8 in Table 3.2. Generally, studies which took some cognisance of the environment were labelled open systems. This process was exacerbated by the widely held view that closed system thinking was 'bad', while open systems thinking was 'good'.

As a consequence of these misconceptions, a number of research opportunities have been missed. Organization studies over a period of 50 years have been disappointing in terms of the low explanatory power and lack of widely-held and well-defined classification regimes. It was suggested that the properties and features of living systems have not been exploited by organization theorists to develop a viable classification system. Such a rigorous classification system is, on the other hand, the domain of the living systems paradigm, as is illustrated in Table 3.3. It provides classifications in terms of subsystem functions that are considerably richer and more comprehensive than the standard classification schemes that are used by organizational theorists.

Arising from this missed opportunity, a second foregone research application has been the lack of development of valuable cross-level hypotheses (Ashmos & Huber, 1987: 614-615). For example, studies relating to the size of the administrative staff ratio have been largely exploratory and have sought simple linear relationships between variables. Borrowing from living systems theory, a more meaningful research hypothesis could have been phrased, "An increase

in the number of components in a system requires a disproportionately larger increase in the number of information-processing and deciding components."

SYSTEMS THAT PROCESS INFORMATION ONLY	SUBSYSTEM FUNCTION	EXAMPLES IN ORGANIZATIONS
Input Transducer	Receives information from system's environment	Market Research Department; Complaint Department
Internal Transducer	Receives information from other subsystems about alterations in their status.	Bookkeeper; Payroll Dept.
Channel and Net	Transmits information to all parts of the system	Switchboard Operator; gossip
Decoder	Alters the code of information received by input transducer into a system.	Signal Officer
Associator	Carries out first stage of learning process, forming associations among items of information.	Intelligence Analyst; Chief Executive Officer
Memory	Carries out 2nd stage of learning process, storing information.	Filing dept.; data input operator
Decider	Receives information inputs from all other subsystems & transmits information outputs that control entire system.	Board of Directors; Executive
Encoder	Alters the code of information input from subsystems, changing 'private' code to 'public' that can be interpreted by environmental components.	Advertising Dept.; Public Relations Experts
Output Transducer	Changes information into other matter-energy forms that can be transmitted over channels in environment.	Salesperson; Publications Dept.
SYSTEMS THAT PROCESS MATTER-ENERGY ONLY	**SUBSYSTEM FUNCTION**	**EXAMPLES IN ORGANIZATIONS**
Reproducer	Gives rise to other systems similar to the one it is in.	Member of organization who sets up a subsidiary
Boundary	Located at perimeter; holds components together protects, permits entry.	Personnel Office; Purchasing Dept.

Table 3.3. Universal Subsystems of Living Systems (From: Ashmos and Huber, 1987)

SYSTEMS THAT PROCESS BOTH INFORMATION AND MATTER-ENERGY	SUBSYSTEM FUNCTION	EXAMPLES IN ORGANIZATIONS
Ingestor	Brings matter-energy across boundaries	Recruiter; Receiving dock
Distributor	Carries inputs from outside or transports outputs around the system.	Forklift Operator; Elevator Operator
Convertor	Changes inputs into functional form.	Training Dept.; Heating Plant Operator
Producer	Forms stable associations among inputs or outputs for the purposes of growth, damage repair or replacement of components.	Maintenance Worker
Storage	Retains deposits in the system.	Stockroom or File Cabinet
Extruder	Transmits matter-energy out of system in the form of wastes or products.	Shipping department; Hospital discharge unit
Motor	Moves system in relation to its environment.	Executive Jet Pilot
Supporter	Maintains proper spatial relationships among components of the system.	(No living supporter at this level); office building; aircraft carrier.

Table 3.3. (Continued) Universal Subsystems of Living Systems (From: Ashmos and Huber, 1987)

This version of the research hypothesis would test for non-linear relationships and would more precisely operationalize the administrative component variable. It would also have the advantage of having been validated at several living system levels. More rapid advances in Organization Theory would come about if the knowledge base of other disciplines was drawn upon.

And so the final missed opportunity relates to the reciprocal knowledge transfer that could take place. Organization theorists have made no effort to study open systems and to identify research directions. Conversely, there has been no effort to update and enrich the systems paradigm with advances that have been made in the field of Organization Theory. In order to better utilize the open systems paradigm, organization scientists need to re-evaluate their

beliefs of open systems and, perhaps, re-educate themselves on how to study organizations as open systems. (Ashmos & Huber, 1987: 614-618.)

2.3 Paradox in Organization Theory.

The study of organizations has spawned a number of theoretical perspectives. Despite the rival and sometimes apparently contradictory theoretical schemes of Organization Theory, there is a growing body of opinion that the so-called acute differences between them are, in many cases, not irreconcilable. In the words of Hartman (1988: 42) :

> We have found reason to believe that the choice among competing theoretical frameworks will sometimes be extraordinarily difficult. But it bears saying now that we do and should use competing theoretical frameworks, even if they are irreconcilable. In some cases...explanations with profoundly different conceptual roots need each other in order to make sense.

Robins (1987: 482) spoke of the conflict between thesis and antithesis, and its resolution through synthesis - resulting in a more viable body of Organization Theory. Ford et al (1988: 446-567), in discussing the Organization Theory of the future, spoke of the necessity for a dynamic model that would describe and explain the dynamic interrelationships between structural variables, leadership preferences, membership characteristics, organization culture, myths, legend and history. Such a dynamic model would finally unite the disparate theoretical viewpoints in the fields of both Organization Behaviour and Organization Theory.

Poole and van de Ven (1989: 562-578) suggested an approach which would go some way toward resolving the conflicting theoretical viewpoints. They proposed that theoretical tensions and oppositions should be actively sought, and then used to stimulate and develop a more encompassing theory. They listed a number of these 'tensions'

in Organization Theory; for example, (i) the structure versus strategy causal conundrum; (ii) environment or strategic choice as the main structural imperative; (iii) organization climate as an aggregation of individual perceptions or as a property of the macro system; (iv) organizations as seeking equilibrium and resisting change or continuously changing and mutating; and, finally, (v) the trade-off between individual identity in groups or the collective nature of group actions.

Each of these dichotomies or tensions were seen by Poole and van de Ven as paradoxes. They defined a paradox as, "Two contrary or even contradictory propositions to which we are led by apparently sound arguments." They went on to say that, "each side of these tensions has been advocated...by different theorists, but together they form a...theoretical discourse...richer than either theory by itself." (Poole & van de Ven, 1989: 564.)

These writers suggested four methods whereby opposing theses may be reconciled.

Opposition. This involved accepting that the paradox existed and learning to live with it. It is a positive stance that would require resistance to pressure toward cognitive consonance, as well as acknowledgement that opposing views can inform one another. Ultimately, models remain models, and are incapable of capturing every nuance of reality. However, different models could lead a vigilant researcher to discover underlying tensions and inconsistencies and so heighten the awareness of the explanatory potential of the models.

Spatial Separation. This tactic would require separation between different levels of organization analysis, and to then explore the connections between them. For any theory at one level of analysis, the researcher can seek oppositions at another level and thus generate a more comprehensive theory.

Temporal Separation. Temporal separation involves longitudinal examination to establish times when one or other theory was ascendant; and then to establish a possible morphogenic cycle between them. This approach can also be used to uncover further tensions and anomalies by looking for points in time when the theory did not fit.

Synthesis. Synthesis requires developing a whole new conception which incorporates both theories by dissolving or superseding the oppositions that they contain. This method may, of course, lead to a whole range of new paradoxes which would then need to be characterized and reconciled into a new construct.

It is doubtful if researchers can ever avoid paradoxes. Resolution in one aspect often creates tension in another, making it unlikely that theoretical paradoxes can ever be escaped or resolved completely. (Poole & van de Ven, 1989: 564-576.)

An interesting application of how paradoxes can be resolved is contained in the work of Danny Miller (1987) which is discussed in the following paragraphs.

3. IMPERATIVES : FURTHER DISCUSSION.

The central debate around organization structure has been on the subject of the so-called structural imperatives. Ever since Woodward (1958) announced her findings with respect to the technological imperative the discussion has intensified. The Aston team (Hickson et al, 1969) added their findings on size as an imperative, and various others have argued for different aspects of the environment as being of causal significance. The following sections will look at organizational life-cycle as a structural influence, and will then examine some recent research with respect to the linkage between environmental uncertainty

and organic structures. Finally, a closer look will be taken at the environment itself and at the efforts that have been made to broaden and fine-tune measures of the environment.

3.1 Life-cycle as an Intervening Variable.

In a wide-ranging consolidation of all the major Organization Theory viewpoints, Miller (1987: 686-701) distilled the main themes, influences and typologies. He coalesced them into a global Organization Theory perspective comprised of four key forces which he labelled *Imperatives.*

Each of Miller's (1987) Imperatives had to comply with three criteria for inclusion into his model;

(i) they had to have been put forward as fundamental and central driving forces in organizations,
(ii) they had to have empirical support, and
(iii) they had to have played a major role in generating organization structures that occur frequently.

Examination of table 3.4 reveals that the main Organization Theory perspectives were indeed covered, although some theorists may have difficulty with Miller's ordering system. For example, elements of the first two imperatives, environment and structure, are most often conceptually combined into Contingency Theory (Neghandi, 1990), and it is the writer's opinion that Contingency Theory could legitimately be expanded to include aspects from all four of Miller's imperatives.

Nevertheless, Miller (1987) believed that all of an organization's problems and response patterns could be characterized in each of his imperatives.

	IMPERATIVES			
	Environment	**Structure**	**Leadership**	**Strategy**
heoretical models : paradigms	Contingency theory; Population ecology; Indust. economics	Resource dependance; Theory of bureaucracies	Personality theory; Psychodynamic literature	Business Policy; Strategic Planning
ɔurce of Influence	Environmental chal-lenges; Competition; Technology	Structural Cons-traints & patterns of interaction	CEO's motives, goals fantasies, neuroses, & talents	Normative concepts of strategy, plans & dis-tinctive competencies
hemes & Elements	Adaptation of struct-ure & strategy to environment & techn-ology; Scanning	Control of task en-vironments via str-ucture; Internal focus; Co-option of environment	Strategy, structure & environment reflect CEO's personality	Explicit strategies & plans; Competitive ad-vantage; selection of markets
onditions of ɔplicability	Uncertain and dyn-amic environment; Much competition; Small size	Barriers to entry; Stable environment; Large size; Trade protection, patents & monopoly; Slack resources	Centralized power & ownership	Commitment to strategy
lustrative pes	Organic (Burns & Stalker, 1961); Adaptive (Miller & Friesen, 1984)	Machine bureaucracy and adhocracy (Mintzberg, 1979; Crozier, 1964)	Compulsive & paranoid configurations (Kets de Vries & Miller, 1984); Simple & ent-repreneurial firms (Mintzberg, 1979; 1973)	Conglomerates (Miller & Friesen, 1984); Cost leaders (Porter, 1980) Prospectors & Defen-ders (Miles & Snow, 1978)
ature of changes ithin configur-ions	Responsive adaptation to environment; Quick incremental change	Insulation & Resis-tance to adaptation punctuated by revo-lutions in response to crisis	Adherence to one basic orientation that resists disso-lution until the CEO departs	Proactive change that seeks out opportunity and enacts the envir-onment

Table 3. 4. Overview of the Four Imperatives
(From: D Miller, 1987: 687)

The Environmental Imperative. The environmental imperative is characterized by a dynamic, challenging environment which calls for prompt responses from organizations in terms of their adaptations to

strategy and structure. There is conformity through imitation in the industry and wide use is made of environmental awareness procedures. It is also characterized by smaller firms in unconcentrated industries with strong competition.

The Structural Imperative. The structural imperative is marked by bureaucratic structures and high resource dependence. It is strong on conformity and resistant to change. Large size, high market share and regulatory measures contribute to a climate that is stable within a munificent environment.

The Leadership Imperative. In the leadership imperative the dominant coalition is perceived as the overriding influence on goals, strategies, decision-making styles, and structure. The emphasis is on personalities and politics and achievement needs and power are the predominant motivators. The personality of the Chief Executive is imprinted on the organization, either directly or through the organization's culture.

The Strategic Imperative. The strategic imperative follows the prescriptions of business policy and strategic management theorists; product market dimensions correlating with structural and environmental dimensions. Strategy will influence the choice of both the environment and the structure and will precede both. Explicit and planned product market scope and strategy, and the development of distinctive competencies and competitive advantage, are developed and coordinated by sophisticated planning departments and committees. The strategic imperative is prevalent in turnaround situations; or where strategy has political support; or in diversified companies with the necessary support and planning staff.

The most important aspect of Miller's (1987) organizational Imperatives is that he introduced the concept of the organization life cycle as an intervening variable. He postulated that the

COMMON TRANSITIONS BETWEEN IMPERATIVES OVER THE LIFE CYCLE

Phase of Cycle	Birth	Growth	Maturity	Revival
Factors initiating Imperative	Founding CEO; Small Size; Centralization; Charismatic leader	More dynamic market; Broader Scope; Founder retires; More competition	More monpoly power; Trade barriers; Market stabilizes; Less competition; Patents; Slack resources.	Deregulation Poor performance; Diversification; Turnaround; Strategic planning
Resulting Imperative	Leadership	Environment	Structure	Strategy Leadership Environment

Table 3.5 Illustrative Transitions between Imperatives
(From: D Miller, 1987: 690)

different imperatives would predominate at different life-cycle stages, as is illustrated in Table 3.5.

Miller's proposition is also an example of the effective use and resolution of paradox in Organization Theory. Firstly he used opposition as a means to clarify and describe a number of apparently contradictory perspectives; and secondly, he effectively used temporal separation by introducing the concept of the organizational life-cycle. The entire field of Organization Theory was thus tied together and made more relevant.

3.2 Environmental Uncertainty and Organic or Mechanistic Structures

The dichotomy of mechanistic and organic structures that was first identified by Burns and Stalker (1961) has been the subject of much discussion and empirical investigation (Galbraith, 1977: 28-30).

Among the more recent studies, Koberg and Ungson (1987: 725-737) performed a study in which they tested specific hypotheses relating to:

- the link between high environmental uncertainty and organic structures;
- the link between low environmental uncertainty and mechanistic structures; and
- predictions for performance depending on the appropriate fit between environment and structure.

Their sample comprised 88 school units as the mechanistically structured group, and 98 operating units of a multinational oil firm as the group with organic structures. Various measures of environmental uncertainty, resource dependence, organizational structure, organizational performance and environment/structure fit were developed and applied.

Surprisingly, the researchers found no relationship between superior performance and fit on the organic structure/uncertain environment dimension; and only limited support for superior performance and the fit between mechanistic structures and an environment of low uncertainty. They also reported that, confronted with the demands of an uncertain environment, organizational units tended to centralize control and to develop more bureaucratic structures, while simplifying and standardizing work procedures. (Koberg and Ungson, 1987: 725-737.)

This group's findings contradicted Burns and Stalker (1961) as well as the Aston (Pugh et al, 1969) and National (Child, 1972) studies. Their results should, however, be treated with caution as there are obvious flaws in their research design. For example, comparing school units and oil companies is hardly comparing apples with apples. They also designated the oil industry as an uncertain environment, yet it is by no means characterized by rapid changes in technology and new product development - as, for instance, the semiconductor industry. What they measured in the oil industry was

more likely crisis reaction rather than ongoing accommodation of a dynamic environment. Finally, all the units in the oil industry sample came from the one multinational group; and so they were effectively branches or subsidiaries. The Aston research demonstrated the misleading effect this could have, especially on perceptions and measures of centralization.

Another study which pursued the relationship between environmental uncertainty and organic or mechanistic structures was that of Miller (1987a: 55-76), who added strategic variables to the environment-structure equation with a view to examining the 3-way linkages between strategy, environment and structure.

	STRATEGIES					
Strategic Variables	CPI	MD	B	GI	GS	CC
*Relationships**	HS C	HS	HS C	HS C	HS C	HS C
Structural Classes						
Bureaucratic uncertainty reduction	- - 0	+ +			+ +0	+? +
Organic uncertainty reduction	+ + +	+ +		+ + +		
Bureaucratic differentiation			+ + +		+? ?	- - 0
Organic differentiation	+ + +		+ +?	+ + +		- - 0
Bureaucratic integration		+ +			+- -	+ + +
Organic Integration	+ + +	+ +		+? +		
Environmental Classes						
Dynamism	+ + +			+ + +	- ? ?	- - 0
Heterogeneity			+ + +	+ + +	+ + +	
hostility		+ +				

*HS C = the Hypothesized, Static data, and Change data relationships
-, + = relationships, if the same as hypothesized, 66% or more correlation
? = Correlations in the predicted direction but less than 66%
0 = No apparent relationship.

Table 3.6. Summary Results of Hypothesis Tests.
(From: Miller, 1987: 69)

Strategy, Miller believed, would have important implications for both structure and environment; for instance, the commonly cited fit between a dynamic environment, product innovation strategies, and organic structures. The strategic variables which Miller factored into the structure-environment equation were:

CPI : Complex Product Innovation
MD: Marketing Differentiation
B : Breadth, the opposite of Porter's (1985) dimension of focus
GI : Growth through Innovation
GS : Growth through expansion into Stable markets.
CC : Cost Control.

Miller's research team used two data bases to test their hypotheses. The first was a static profile of 161 major US firms at a given point in their histories. The second data base was longitudinal and analysed changes over a five year period in a sample of 110 Canadian and Australian companies.

Table 3.5 summarizes the research in terms of the hypothesized relationships and the actual relationships found in both the static profile and the change data. Most of the hypothesized relationships were supported by the research. When a strategy increased the stable, predictable contingencies facing an organization, it was likely to be accompanied by bureaucratic uncertainty reduction devices in the form of formalized rules and precedents, standardization, and formal hierarchical authority. Conversely, a strategy that increased uncertainty of the contingencies faced by an organization elicited organic uncertainty reduction devices, such as environmental scanning, delegation of routine decisions, group decision-making sessions, and allocation of expertise-based authority.

They also found that strategic and environmental variables were significantly related. Innovative CPI and GI strategies were

commonly followed in dynamic environments, the CC strategy was present in a stable environment and the MD strategy was associated with a hostile environment. (Miller, 1987: 65-71.)

Although the research design was well constructed and the results were significant, Miller was nevertheless careful to reiterate that he was not making any claims for causality. "It should be stressed...that we cannot claim strategies to be causing ...certain structures, any more than we can claim the opposite direction of causality." All that could be said was that certain strategies and structures commonly went together and were found in particular types of environments. (Miller, 1987: 70.)

3.3 Fine-tuning the Environment

The somewhat nebulous term 'environmental uncertainty' was the subject of an investigation by Wholey and Brittain (1989: 867-882), who proposed that the commonly used measures which gauged a manager's perception of total environmental uncertainty were possibly inaccurate. Environmental uncertainty was probably composed of several variables and by using only one measure it was likely that most researchers had missed certain critical components of uncertainty. The commonly used measures looked at the amplitude of environmental variations and took no cognisance of their frequency and predictability. This proposition was tested using time series monthly production and sales data from five thousand manufacturing companies and 1097 restaurants. The researchers tested their operationalized definitions of amplitude, frequency and predictability. The results indicated that they were, indeed, discrete and measurable variables. They concluded that their research made a positive contribution to empirical Organization Theory by enhancing its measurability and its scientific viability.

On a similar tack, the effects of environmental munificence, or

scarcity, on the relationship of context to structure was explored by Yasai-Ardekani (1989: 131-156). He postulated that munificence or scarcity would have a mediating effect on the classic relationship between turbulent environments and organic structures in that the structure will only tend toward organicity if the environment is both uncertain and munificent. Under conditions of scarcity, a turbulent environment is more likely to elicit a crisis-like reaction resulting in a mechanistic response of greater centralization and bureaucratic controls.

Looking at its effect on technology, environmental munificence would lessen the need to protect the organization's core technology; while conditions of scarcity would increase the need for protection. This situation would be exacerbated if the technology was inflexible and rigid. Organizations with inflexible technology were more likely to increase their complexity in terms of the range and number of specialists that they deploy in conditions of environmental scarcity. (Yasai-Ardekani, 1989: 132-138.)

The relationship between size and structure, Yasai-Ardekani (1989: 140) suggested, would be unaffected by environmental munificence. Greater size always leads to more complexity, formalization and decentralization regardless of whether the environment is munificent or scarce. In smaller organizations, though, the slope of the relationship, while tending in the same direction, may be different.

Yasai-Ardekani's (1989) sample consisted of the 45 electrical engineering companies of the CUBS study (Grinyer & Yasai- Ardekani, 1980.) Structural measures were obtained using the abbreviated Aston methodology, while munificence and scarcity was defined as the rate of demand for an organization's products or services. He found general support for his contention that scarcity or munificence would exercise a mediating effect on the context/structure relationship. He also confirmed that a combination of an uncertain environment and scarcity was more likely to trigger a crisis

reaction, resulting in a move towards a mechanistic structure combined with formalization, standardization and centralization. (Yasai-Ardekani, 1989: 150-151.)

4. CONTRIBUTIONS FROM OTHER DISCIPLINES.

The discipline of Organization Theory is sometimes regarded as the orphan child of Sociology (Hinings, 1988), and as such attempts are often made by other behavioural science disciplines to adopt the fledgling science.

4.1 An Accounting Perspective.

An accountant's perspective of Organization Theory is provided by Jensen (1983: 319-349). Proceeding from the viewpoint that, "accounting is a basic part of the structure of every organization," he proposed that greater understanding of an organization's structure could be obtained by examining its accounting system. He developed a three-part taxonomy to characterize and classify organizations by their control systems:

(i) the performance measurement and evaluation system,

(ii) the reward and punishment system, and

(iii) the system for dividing and assigning decision-making authority.

An organization was defined as, "a legal entity that serves as a nexus for a complex set of contracts...among disparate individuals." (Jensen, 1983: 326).

Jensen believed that the nexus of contracts viewpoint helped to explain why certain contractual relations, or structures, arose and

how they interacted with the environment. In other words, it lent understanding to the behaviour of individuals and groups with diverse and conflicting objectives who, nevertheless, worked toward preserving a common equilibrium. Ultimately, the survival of an organization was dependent on the delivery of products and services at the lowest price while covering costs.

With its emphasis on interacting systems (contractual relations), environmental exchange, and success being judged on the basis of survival, Jensen's accounting viewpoint can be loosely classified as falling with the open systems ambit - a sort of "financial structural functionalism".

4.2 An Organization Economics Perspective.

The view of organizations as nexus of contracts is supported by Hesterly, Liebeskind and Zenger (1990: 402-420), who saw organizations as *governance mechanisms* supporting the exchange of goods and services under less-than-perfect conditions which were susceptible to cheating and misrepresentation.

Hesterly et al (1990) called their point of departure an Organizational Economics perspective. They explained the diversity of structural arrangements as being dictated by the demands of the exchanges that take place on the one hand, and the governance mechanisms that are used on the other. Another structural imperative can also be added to the contingency theorist's repertoire - that of cost-effectiveness. The eventual type of organizational structure that is assumed will depend on its costs when compared to other alternative arrangements. They believed that Organizational Economics is a structural functional perspective in that it attempted to explain organizations in terms of their consequences or functions rather than in terms of the processes that brought them about. (Hesterly et al, 1990: 405-406.)

Hesterly et al (1990), in common with Jensen's (1983) accounting view, placed emphasis on the authority mechanisms of an organization and its systems of reward and punishment as descriptive dimensions of structure. In this respect, both the accounting and the organizational economics viewpoints are closer to Taylor's scientific management or McGreggor's Theory 'X' principles, than they are to modern behavioural and motivational theory. Nevertheless, both viewpoints do provide some useful insights and could be of some use in empirical research; for instance, in operationalizing bureaucratic control mechanisms, or in refining typologies of structure.

4.3 Economics Theory: the Indifference Curve.

An interesting insight into the application of classical economic theory to a very topical Organization Theory dilemma was illustrated by Zeffane (1989: 327-352). He applied the concept of an indifference curve to the centralization/formalization conundrum of bureaucratic control. Referring to the Aston (Pugh et al, 1969) and National (Child, 1972) studies, Zeffane (1989) discussed the apparently contradictory findings on centralization between these two studies and maintained that an element of choice or trade-off is indicated. As an organization increases in size the pressure to decentralize, with its concomitant loss of control, is compensated for by increasing indirect control through formalized rules and procedures. This is the basis of the theory of bureaucracy. But the question is: how much decentralization and how much formalization? Essentially, the organization's dominant coalition must choose between equally viable means of structural control in a way which maximizes organizational effectiveness.

The concept of the indifference curve was introduced by Zeffane (1989) in an effort to find this ideal mix of decentralization and formalization. The indifference curve embodies the idea of marginal utility which defines the point at which the trade-off between one

structural control mechanism becomes less desirable or feasible and the other becomes more desirable or feasible.

In operationalizing the concepts, Zeffane was able to define centralization and formalization quantitatively in terms of costs. He also added a subjective factor, Propensity to Formalize/Decentralize, as a weighting factor to cater for the effects of organizational climate and culture. He was then able to compile the standard economics equations to illustrate indifference curves and equilibrium points, at which the optimal centralization/formalization situation existed within the constraint of size. (Zeffane, 1989: 340-342.)

Zeffane (1989) suggested that the apparent discrepancies between the Aston and National findings on centralization and formalization was partially due to organizations in the samples not being at their equilibrium, or optimal, points. All in all, Zeffane's (1989) perspective adds to the understanding of Organization Theory by illustrating that centralization and formalization are not a simple dichotomy and that considerable variation is possible. The biggest problem in the practical application of this perspective will be plugging in accurate numbers into the operationalized definitions and equations. This is a problem that is also fairly common in the rest of the field of micro-economics.

5 STRUCTURAL ISSUES IN HIGH TECHNOLOGY ORGANIZATIONS.

To conclude this section on current perspectives on Organization Theory and Structure, some structural issues which are unique to High Technology industries will be touched upon. It will be recalled that it was the apparent structural anomalies in the South African Electronics Industry that were used to illustrate the research problem that is the subject of this study. Doubtless, there are special circumstances that apply in a high technology environment and some understanding of them would be profitable. A high technology industry

can be categorized by three factors:

(i) businesses require a strong scientific-technical base,

(ii) new technology can quickly make old technology obsolete, and

(iii) as new technologies come on stream their applications create or revolutionize markets and demand. (Covin, Prescott & Slevin, 1990: 485.)

Implicit in these characteristics is a turbulent environment. The relationship between an unsettled environment and structures which tend toward organic configuration has been well documented and has been discussed in the preceding sections of this study.

Covin et al (1990: 485-510), working with a sample of 344 smaller firms (400 people or less) again found strong support for this relationship. However, there have occasionally been inconsistencies and contradictions of this relationship in the research literature (Koberg & Ungson, 1987; Yasai-Ardekani, 1989). And so the relationship between environmental uncertainty or turbulence and organic structures remains problematic to a degree, with high technology firms sometimes exhibiting both mechanistic and organic characteristics.

A study by Bahrami and Evans (1989: 25-50) tried to shed light on this apparent paradox by means of a 5-year longitudinal study of 33 high technology firms in Silicon Valley, California in the United States. The researchers found that the life cycle stages of high technology firms tended to be rapid and characterized by sometimes cataclysmic changes from one life cycle stage to another. Growth tended to be rapid and strategic and organizational adjustments complicated.

To cope with these pressures, high technology firms had developed a new structural variant, dubbed *Stratocracy* by Bahrami and Evans (1989: 39). This was a bimodal form which enabled a firm to be both

centralized and decentralized and to utilize both mechanistic and organic responses.

The stratocracy was accomplished by realigning the strategic apex and the operating core so that the former could, when necessary, talk directly to the latter. Centralization was thus enhanced but decentralization was also fostered by allowing line managers the authority to take decisions independently within the parameters of structural constraints. Specially appointed executives at key connective, or nodal, points in the organization facilitated communication and co-ordinated action. The stratocratic structure was able to successfully harness and deploy the tensions between creativity and discipline, flexibility and cohesion, responsiveness and coordination, and, finally, cost control and product innovation.

The success of the stratocratic alignment is, of course, largely dependent on the personality and operating style of the Chief Executive and the dominant coalition. In a South African context this is well illustrated in the Altron group of companies where the Chief Executive, Doctor Bill Venter, has never lost sight of his entrepreneurial roots. Despite the huge size of this electronics giant, it is common knowledge and practice that Dr Venter can, and very often does, speak directly to anyone at any level in the organization. The action generated by this direct communication style is in accord with an organic response pattern; and yet the group loses none of the benefits of being a large bureaucracy.

The strength of the Stratocratic form is the achievement of the advantages from bureaucracy's high efficiency through standardization while, at the same time, obtaining flexibility from entrepreneurship.

6. ORGANIZATION THEORY AWAY FROM A WESTERN ENVIRONMENT.

In keeping with the trends in most of the management sciences, nearly

all of the significant research in the field of Organization Theory has been carried out in Western society in a heavily industrialized environment. Any research emanating from third world or developing countries has come mainly from the Far East. Although in a lot of instances the term developing country is now a misnomer; particularly when one considers that Japan has become the world's second largest economy - and is expected by many economists to be the largest by the turn of the century (Time Magazine, 10 February, 1992).

The following paragraphs will present a cross section of some of the countries where quantitative research has been carried out, namely South Korea, Egypt, Japan, Jordan, and India. There has, as far as is known, been no published quantitative research in Africa south of the Sahara; and so this section will conclude with a brief qualitative look at Organization Theory in Africa.

6.1 South Korea.

The question of the applicability of advanced Western, usually American, organization and management theories to developing countries was pursued by Kim and Utterback (1983: 1185-1197). They looked specifically at the relationships between operations technology, environment, structure, innovation and size. They stated that the generally accepted wisdom in developed countries is that an organization evolves from small size, flexible technology, high innovation and organic structure in its infancy, to large size, rigid process technology, less innovation and mechanistic structure as it matures and grows. These changes follow environmental influences as a new industry with high uncertainty and many product innovations develops into a stable industry with fewer innovations, allowing a more rigid structure and operations technology.

Using a sample of 31 manufacturing organizations in the South Korean electronics industry, Kim and Utterback resolved to test whether

this pattern of evolution holds true in a developing country. Ideally, their research needed to be longitudinal but this was not possible. To simulate longitudinal research they divided their sample into two groups; one group consisted of 17 older companies and the other of 14 younger companies. The patterns of associations that they found were very different from those of developed countries.

Using Aston and other measures, they measured the variables of technology, structure, environment, size, and the amount of innovation. They found that in Korea manufacturing organizations in young industries had adaptable operations technology, mechanistic structures, infrequent product changes, and were mainly concerned with the assembly of imported, standardized products with little local technical capability. Looking at the environment, they perceived government incentives and raw material and equipment suppliers as the most important influences.

Conversely, in the older industries the researchers found more rigid operations technology, greater size, organic structures, and frequent product changes. Older firms perceived their customers, competitors, suppliers and technical and capital investment as the most important environmental influences. (Kim & Utterback, 1983: 1194-1196)

The research team found that, apart from operations technology which follows the normal development pattern, the process was virtually the opposite of that in a developed country. Operations technology followed the normal route but for different reasons; its initial capital intensity and flexibility was because it was labour intensive in order to take advantage of the almost limitless cheap labour.

Kim and Utterback (1983: 1194-1196) speculated on the possible reasons for this very different sequence of evolution in a

developing country. Unlike the situation in a developed country, a Korean organization's early functioning was actually in a stable environment in terms of technology and markets. This was because the technology was imported and was tried and tested, while the market was purely local and heavily protected by legislation. As local improvements were made on the imported technology, and markets expanded to include both export and internal competitors, so pressure increased for the organization to adopt response patterns more suited to a turbulent and competitive milieu.

Kim and Utterback's (1983) study is interesting but, nevertheless, should not be regarded as anything more than exploratory. Longitudinal measurements cannot really be simulated and genuine longitudinal studies would have to be conducted in order to confirm their initial results.

6.2 Egypt.

Having discussed the monumental organizational feats of the ancient Egyptians the previous chapter, it was interesting to return to Egypt five thousand years later. The public sector in Egypt was the subject of a study by Badran and Hinings (1981: 3-21) who attempted to test theoretical concepts developed in Western industrial society on public enterprise in a developing country. The empirical thrust of their study went further than the purely conceptual work that had been done in developing countries up to that time.

The Egyptian economy was broadly socialist and so they postulated that public enterprise would be highly structured and centralized. They also examined the effects of the contextual variables of size, technology and dependence; hypothesizing that:

- size and technological complexity would be positively related to structuring of activities and decentralization, and

- dependence would be positively related to structuring of activities and negatively related to decentralization.

The sample consisted of 31 public sector companies in the metal, spinning, weaving, food, chemical, construction and service industries. The Aston short form schedule was used to collect data.

Comparing the overall results with those of the Aston study, Egyptian organizations showed less technological sophistication, although they did score higher than another Middle Eastern country, Jordan (Ayoubi, 1981). The dependence scores of Aston and Egypt were roughly the same, and the size of the Egyptian firms was generally large. Functional specialization scored higher in Egypt indicating more offices involved in the public sector. Standardization was markedly higher, also indicating the public accountability and central planning of a socialist economy. Formalization scored about the same as Aston, although there was less variability - signifying the presence of written policies and job descriptions but not much in the way of research and development procedures. All in all, Egyptian public enterprise was synonymous to Pugh et al's (1969) Personnel Bureaucracy. (Badran & Hinings, 1981: 12-17)

As in the Aston studies, the factors comprising the structuring of activities variable, i.e. specialization, standardization and formalization, were highly correlated - also providing convincing support for the hypothesized high level of structuring and centralization. Structuring was found to be positively correlated to both size and technology. This differed from the Aston findings in that technological complexity was positively related to size, whereas the Aston team (Hickson et al, 1969) had said that technology was only an important structural determinant in small organizations, or at the operating core of larger organizations.

Badran and Hinings (1981) speculated that the reason for the different Egyptian results was that the technology was mostly imported and expensive and involved high capital outlays. More

specialists would be employed to look after expensive equipment and it would most likely be allocated to larger organizations. Decentralization increased with size - and technological sophistication also encouraged decentralized decision making close to the point of operations. Strong dependence on external structures meant that the locus of policy-making decisions was concentrated. A wide range of political, administrative and executive bodies typical of a socialist economy produced strong structures of formal accountability. The tentative separation of operational decisions and policy decisions was also explored by Azumi and McMillan (1981) in their Japanese study and is discussed in section 6.3 below.

The relationship between size and technology in the Egyptian study was particularly strong while dependence was negatively related to both. The effects of size and technology on structuring were more complex and suggested an interactive effect of both size and technology, with neither being clearly dominant. This was also at variance with the Aston findings and was probably also due to the expense of imported technology and the fact that it was allocated to larger companies, as was discussed earlier. Another contributing factor was that Egyptian public enterprise was not involved in either large scale process industries or major retail outlets - both of which would exercise a moderating effect on the size/technology relationship.

The researchers also spoke of the possible 'late starter effect' on Egyptian industry in that late starter countries are inclined to show more developed forms of bureaucracy from the very beginning. This was evidenced in the relatively high technological level and the clearer relationship between technology and structure than was present in many other studies which had used the Aston framework.

Generally the relationships identified by Badran and Hinings (1981) had been consonant with those identified in earlier research in Western countries. In addition they had determined the impact that a specific political economy could have in producing organizations with high levels of structuring and concentration of authority.

6.3 Japan.

It was said earlier that Japan could hardly be classified a developing country any longer. Its enormous technological and industrial advances, and propensity to assimilate only the best of Western Organization Theory and management concepts, has transformed it from a largely rural and isolated economy to a world leader. Pucik, Beechler and Ito (1986: 20-26) traced the development of Japanese Organization Theory from its importation from the United States after World War 2, to its refinement and development in the 1950s and 1960s, to its re-export back to the West during the 1970s and 1980s. They believed that the basis for a truly international Organization Theory as propounded by convergence theorists is likely to spring mostly from Japan.

In a wide-ranging study of 50 organizations in the Okayama prefecture in south-western Japan, Marsh and Mannari (1981: 33-57) re-examined the causal importance of both size and technology on organization structure. They made it clear at the outset that they were seriously questioning the size imperative and that they doubted that either size or culture would exercise an overriding causal effect on the structure of Japanese industry.

They collected data using the standard Aston schedule items, together with items from other research. Their sample of 50 firms represented 13 out of a total of 21 industries classified in Japan's census of manufacturing. The independent variables were size and technology. The first was measured in the normal way as a factor of total headcount. Because Technology was the focus of the study the researchers decided to measure it in three ways; the first using Woodward's (1958) classification, the second using a system devised by Amber and Amber, and, finally, measures developed by Khandwalla and based on Woodward's classification. (Marsh & Mannari, 1981: 37-38.)

In addition to the independent variables, the researchers identified a number of contextual variables which they intended to control in order to isolate the effects of size or technology. The Aston researchers had classified autonomy as a dependent structural variable but Marsh and Mannari (1981) disagreed with this and said that it was more correctly a contextual variable because of its similarity to dependence and its significant effect on centralization. The control variables, therefore, were dependence, autonomy, age, and the number of sites.

The dependent variables were very broadly defined and, apart from the normal structuring of activities - here labelled structural differentiation - they included such diverse items as costs and wages, labour inputs, and union-management relations.

The results indicated a strong size influence on structural differentiation, which was also affected by some of the control variables. The researchers found, however, that technology was more closely related to labour inputs, the percentage of graduates, costs and wages, and union recognition. Mixed relationships were present between size and technology and centralization and authority structure, and horizontal span of control. The Chief Executive's span of control was more a function of technology and foremen's span was a function of both technology and size. The size and formalization relationship discovered by the Aston group was strongly supported. Altogether, the Okayama researchers believed that they had found new support for the technological imperative. Size, they maintained only influenced 2 variables: structural complexity and formalization. They discounted cultural explanations for their data and firmly believed that they had discovered a new lease of life for the technology imperative, supporting the causal chain of:

technology ▹ structure ▹ size

which had first been proposed by Aldrich (1972) in his re-examination of the Aston data. (Marsh & Mannari, 1981: 52-54)

The Okayama data were subjected to a critical re-analysis by Singh (1986: 800-812) who strongly disagreed with the findings of the original research team. He demonstrated a lack of construct validity in their research design and pointed to the consequent errors in the measurement of causal parameters. He also provided a detailed and painstaking critique of the Okayama research model, maintaining that it did not fit the data. He also questioned the technology measures that were used and said that the Khandwalla scale, which had been discounted by Marsh and Mannari (1981), was in fact a better measure than the ones they finally used. Finally, he objected strongly to their very broad definitions:

> One important implication of these findings is that it is inappropriate to place unrealistically wide boundaries on the concept of organizational structure and to consider dimensions as diverse as costs and wages, structural differentiation, owner-management differentiation, and labour inputs to be aspects of structure. Further studies should...be more precise...theorizing about specific structural dimensions, rather than structure as a monolithic construct. (Singh, 1986: 810).

In summary, Singh (1986) could find no support for the Okayama researchers contention that they had discovered a new lease of life for the technology imperative.

A study (Azumi & McMillan, 1981: 155-172) was carried out in another Japanese prefecture, Tochigi, which is 150 kilometres north of Tokyo. It also involved a sample of 50 companies, but this time including 19 of the 21 industries classified in the Japanese census of industries. Again, the objective of the researchers was to test the applicability of Western Organization Theory concepts developed in the United States and the United Kingdom in Japanese organizations. They also wanted to evaluate the significance, or otherwise, of Japanese culture on its organizations; for example, the strong hierarchy, cultural homogeneity, unique decision-making processes, and lifetime employment. Ultimately, despite the different cultural milieu, Japanese organizations were still faced with the same organizational constraints including size, technology and operating context.

The researchers used the Aston methodology identical to that used by Pugh *et al* (1969) and Child (1972). The Japanese sample was similar to the Aston sample in terms of its heterogeneity and organizational status, i.e. branches and principal units. This meant that the results could be compared with the Aston and National stu-

	n	Size	Specialization	Formalization	Centralization
Aston*	46	3370	10,2	27,1	77,5
National**	82	1542	10,1	26,7	50,0
Japan	50	946	9,1	32,9	122,1

Table 3.7. Mean scores on size and selected structural scales in Aston, National and Japanese samples. (From Azumi & McMillam, 1981)
*Pugh et al, 1969
**Child, 1972

dies; this is illustrated in Table 3.7. The most striking immediate differences are the clearly higher scores on formalization and centralization. Generally, Japanese firms were found to be more formalized, more centralized and less specialized, but with more vertical levels.

The higher scores on both formalization and centralization appeared to give the lie to the 'alternative strategies of control' hypothesis developed by Child (1972) and others. In considering this apparent anomaly, Azumi and McMillan (1981: 162) were reluctant to pursue explanations rooted in cultural or sampling differences. Instead, they looked at a finer definition of decision-making as it applied to centralization in their study; and which they believed would also clarify the apparent discrepancies between the Aston and National studies with respect to centralization. They drew a distinction between operational and strategic decisions and found that the latter were generally centralized while the former were

delegated.

This, they believed, argued against a unidimensional centralization scale. Sifting out the strategic decisions that affected the entire organization, they found that there was indeed support for alternative control strategies. This was expressed as high centralization of strategic decisions and high formalization. It was not necessarily accompanied by more specialists. Similarly, increased size led to greater delegation of operational decisions and more formalization. "One could say that managerial decisions are either significant, in which case they are not delegated, or delegated, in which case they are not significant." (Azumi & McMillan, 1981: 163-171.)

In summary, they found a consistent pattern of strategic decisions being centralized, regardless of the size of the organization or its technology. Greater size was associated with more delegation and increased formalization and support staff. Size did affect the range of decisions that were delegated. In general, Japanese firms made more use of production, workflow and design specialists, as opposed to British and US firms which are dominated by accounting and financial experts.

6.4 Jordan.

In another Middle Eastern study Ayoubi (1981: 95-114) used the Aston methodology in Jordan. His objectives were stated in the, by now familiar, framework of ascertaining:

(i) whether theories generated in industrialized countries had validity in terms of the size-structure-technology linkages in a developing country, and

(ii) whether scales and methods used in industrialized countries could be regarded as valid and reliable in developing countries.

Industrial activity in Jordan was very concentrated with a small number of generally small-sized firms. Most were family-owned or dominated. For the purpose of testing hypotheses, Ayoubi split structure into configuration on the one hand and structuring of activities on the other. He postulated that the former would be correlated mainly with technology and the latter mainly with size. He also proposed that centralization would be correlated with the amount of government ownership.

Data were collected from 34 firms which represented 64% of the largest firms in the country. The standard Aston Schedules were used and tested for construct validity and internal consistency. Some elimination of items was needed in each scale and, eventually, a high internal consistency was achieved on the revised scales. Most adjustment was required on the technology scales. The unrevised Aston scale achieved an internal consistency reliability coefficient of only 0,23. Ultimately, a scale was devised which was a composite of Aston, Woodward, and Amber and Amber (Ayoubi, 1981: 103) and it had an internal consistency of 0,92.

The results indicated firstly that, compared to similar studies in industrialized countries, the scores for specialization and formalization were very much lower. Two reason were advanced for this: firstly, the number of scale items had been reduced, but, more likely, it was because the Jordanian bureaucracy was in its infancy. The technology relationship to configuration was stronger than in industrial countries, providing support for Hickson et al's (1969) contention that technology exercised a much greater causal effect on small organizations. The major relationships are summarized in Table 3.8.

It will be seen that size was the strongest explanatory variable of specialization, standardization, formalization, vertical span and span of the chief Executive, and ratio of administrative employees. Production continuity exercised the strongest explanatory influence on the subordinate/supervisor ratio and the

percentage of direct workers, non-workflow personnel, and university graduates.

	Strongest Explanatory Variable				
Organization Structure Variables	Size	Production continuity	Automation	Throughput continuity	% of Govt ownership
Functional Specialization	X				
Overall Standardization	X				
Overall Formalization	X				
Centralization					X
Vertical Span	X				
Chief Executive Span	X				
% of total number of employees in					
Transport	X				
Administration	X				
Subordinate/supervisor ratio		X			
% of total number of employees who are					
Direct Workers		X			
Non-workflow Personnel		X			
Indirect Workers		X			
University Graduates		X			
Purchasing and stores		X			
Clerical Workers			X		
Maintenance			X		
Accounts			X		
Inspection				X	

Table 3.8. Summary of Correlations : Selected Structural & Contextual Variables. (From Ayoubi, 1981: 107)

Ayoubi (1981) suggested that similar research directions should be pursued in other developing countries to test his hypotheses in a variety of wider settings. Technology, in particular, needs further definitional clarity in a developing environment; it appears that developing countries move quicker down the unit/batch/mass-production paradigm. Development of technology in a developing country is more a function of the transfer of technology in incremental bits

from another country, as well as the ability to then operate the technology locally, with the minimum of social and other adjustments.

Government ownership in Jordan presented interesting relationships to centralization, which appeared to be opposite to the effect of size. Ayoubi (1981) detected tension between government funding and increased pressure for more central control on one hand, and growth and increased pressure for decentralization, on the other.

The implications of the Jordanian study for developed countries was, in the view of Ayoubi (1981), mainly evident in the size versus technology imperatives. Size, he had determined, was more important to specialization, formalization and standardization; i.e. Aston's structuring of activities. Technology, on the other hand, was a more important influence on configuration variables. This standpoint provided further support for Child's (1972) findings and his contention that, "The dispute between technology and size theorists derives largely from the fact that they have been studying different facets of organization." (Child, 1973: 383).

Perhaps the most important finding of the Jordanian study is that, after testing for validity and reliability, the Aston measures, with the possible exception of the technology scale, held up well in a developing country. However, the timespan of the research could be problematic. Because of the volatility inherent in most third world and developing countries, two or three years to pursue a research direction, is often just not possible.

6.5 India

In another Far Eastern application of the Aston methodology, Shenoy (1981: 133-154) examined a number of organizations within the broadly socialistic economy of India. The main objectives of his study were expressed by Shenoy (1981) as being to determine the

dimensions of structure and context and to examine the relationships between and among structural and contextual dimensions with a view to comparing them to those from elsewhere.

Shenoy's (1981) sample consisted of 35 units employing 200 or more people and covering the full range of 9 different industries in the population from which the sample was drawn. The standard Aston scales were modified to suit local conditions, with the fewest modifications required in the critical scales of specialization, formalization and centralization.

Shenoy (1981) found no support for the idea of alternative control strategies. Instead, he found that in Indian organizations centralization and formalization existed as independent rather than alternative strategies. It was to be expected that the Indian scores on structuring of activities would be higher than other nations because of the centuries of exposure to British colonial bureaucracy.

	Formalization			Specialization			Centralization		
	$\bar{X}$	S.D.	Range	$\bar{X}$	S.D.	Range	$\bar{X}$	S.D.	Range
Poland (n = 11)	29,6	8.6	25-41	12,8	2,3	10-14	172,6	16,4	139-180
Britain (n = 11)	27,4	7,3	14-37	7,3	3,3	0-11	119,9	12,5	104-141
Japan (n = 11)	28,6	9,5	10-41	8,2	3,0	0-13	120,0	25,5	66-162
Sweden (n = 11)	22,6	11,0	13-37	8,3	2,6	6-15	125,4	9,5	111-142
India (n = 11)	34,3	5,8	23-41	7,1	1,7	4-10	401,2	173,2	183-696

Table 3.9. Structuring of Activities in Poland, Britain, Japan, Sweden and India. (From Shenoy, 1981: 143).

Table 3.9 compares the Indian structural scores with a cross-cultural study that was performed by Kuc, Hickson and McMillan (1980). Although manipulation of the scales to adjust for local conditions prevents precise comparisons, it is evident that

the Indian score on specialization is lower while those on centralization and formalization are considerably higher. Shenoy (1981: 142-144) conjectured that the high formalization was a direct result of British bureaucratic management tradition while the high centralization reflected the dire shortage of skilled middle management. Most decisions, especially in the smaller firms, are made by the managing director.

The question that Shenoy (1981: 143) asked with respect to structure and context was, can the influences of size and dependence outweigh the effects of India's ancient and powerful culture? The answer was that apparently they do. The core cross-cultural relationship proposed by Hickson et al (1974) appeared to be present in the Indian data. Size was positively associated with formalization and specialization in common with the general direction of the relationships in virtually all the other countries where the Aston research had been replicated. Similarly, dependence correlated with centralization, although the stable hierarchy of Indian society probably made centralization easier to achieve.

The relationship of technology to structure was not as straight forward. In keeping with the results of studies in other developing countries (Kim & Utterback, 1983; Badran & Hinings, 1981; Ayoubi, 1981) Shenoy (1981) found that the fact that most technology was imported exercised a different affect on structure than in industrialized countries. In India production technology was positively related to structure and the tendency was for firms to simultaneously centralize and bureaucratize as technology became more advanced. Managerial and technical skills were concentrated at the apex where decisions were taken, while, at the same time, specialists were taken on to control the more complex technology, leading to more formalization.

Shenoy (1981: 144) concluded his study by saying that the broad similarity of Indian organizations to the rest of the world indicated that there was an overall accommodation between

bureaucratization as a process on one hand, and the ancient ways on the other.

6.6 An African Perspective.

Apart from the Egyptian study of Badran and Hinings (1981), there has been little or no focused study of organizations in Africa, particularly of organizations in countries south of the Sahara.

Blunt (1983: 147) maintained that managers of African enterprises did not see their organizations as open systems and generally subscribed to the "one best way" viewpoint. They were largely unaffected by the contributions of contingency theory and a study of Zambian copper mines reinforced the perceptions of outdated management methods and philosophy.

As to relationships between context and structure in Africa, Blunt (1983) believed that the normal causal relationships would be present but, unlike other developing countries, culture would exercise an important effect on structure, particularly in the context of the turbulent environment and socio-political upheaval that characterizes Africa. He also documented the effects of tribal kinship and culture in a study of two Kenyan organizations. (Blunt, 1983: 136-141).

In the first organization, a senior supervisor from the Luo tribe was appointed to a position where he controlled recruitment and allocation of duties. Within a year of his appointment the percentage of Luos in the organization had more than doubled. Allocation of duties had been reconstituted to comply with tribal custom; older men performed lighter work and day shifts while younger men did the more unpleasant work and night shifts. Counter to expectations there were no grievances with these arrangements. On the contrary, absenteeism was slashed, there were fewer customer

complaints, and damage to company property declined drastically.

The second organization was owned by a white man who recognised the unique cultural aspect of African organizations and had capitalized on them. He used the strong bonds of tribal kinship and solidarity of his Luo employees to improve organizational control.

In a Nigerian study Blunt (1983: 138), emphasized tribal and ethnic affiliations in reward and assessment functions. Although there was little difference between Nigerian and US perceptions of submission to legitimate authority, the Nigerian sample *expected* ethnic and tribal factors to intervene in the work situation.

The culture of colonialism has also left an enormous tradition in Africa.

> The legal and government 'culture' of colonialism, which was served by rigid bureaucratic structures, and designed to further and maintain the interests of the ruling elite, has, in the eyes of some observers, continued to perform the same function for new elites since independence.
> (Blunt, 1983: 139).

In summary, Organization Theory in Africa is complicated by a turbulent political environment to the extent that the stability of cultural influences may exercise a greater effect on structure than in other, more settled, societies. The work by Blunt (1983) appears to be the only substantive comment on Organization Theory in Africa. A computer search carried out by the library of the University of South Africa has failed to reveal any South African Organization Theory references to research done in this country.

7. ORGANIZATION THEORY UNDER FIRE.

Earlier in this study the point was made that Organization Theory is a young science which has its origins in the discipline of Sociology.

Hinings (1988: 2-7) traced the major changes that have occurred in Organization Theory, the most important of which was its migration from the Sociology faculty to the Business School or Management Centre on campuses throughout the world over the past 25 or so years. Initially, this entailed the physical relocation of people but, increasingly, the schism has become institutionalized - to the extent that Graduate Business Schools are offering fully-fledged doctoral programmes in Organization Studies. The professional basis for Organization Theory has, therefore, changed drastically.

Hinings (1988) also alludes to the great differences in the perceptions of Organization Theory that exist in North America, which is tied to its traditions of Structural Functionalism, and Europe - particularly the United Kingdom. In fact, most of the criticism of Organization Theory, and its foundations in systems theory and structural functionalism have come from theorists in the UK.

Donaldson (1985) lamented the fact that despite the enormous advances in empirical and theoretical knowledge over a period of three decades, nobody from what he called the functionalist-positivist school of Organization Theory was prepared to take on the increasingly strident attacks that were being made. Organization Theory was variously being labelled tautological, philosophically naive, ideological, managerially biased, and methodologically flawed.

The assault on Organization Theory has come from two main quarters; from proponents of Social Action Theory on one hand, and from theorists wedded to radical-structuralism or neo-Marxism on the other.

7.1. The Assault: Social Action Theory.

Social Action Theorists criticize Organization Theory as being too concerned with structure while ignoring the actions of individual members of the organization and the meanings that they attach to their social interactions. The exponents of individual motives

find problems, firstly, with systems theory and structural functionalism which ascribe goal-directed behaviour to organizations. This, the individualistic critics maintain, reifies the organization and fallaciously attributes concrete existence and motives to it. This, in their view, is nonsense since only individuals can have motives or goal-directed behaviour. The language of Organization Theory and talk of organizational analysis is, they continue, an effort by sociologists to endorse management's view of the organization and to confuse individual employees so that they can be manipulated into compliance. Structural functionalism is a static theory and is, therefore, incapable of explaining change. (Donaldson, 1985.)

By contrast, Social Action theorists believe that their approach is more sociologically acceptable and has more utility for "suffering humanity". Analysis of individual perceptions and values will uncover the origins and manifestations of conflict. Aspects which a structural approach is not capable of doing because it focuses on equilibrium and is not able to recognise change or conflict. It is an ideology for preserving the status quo by manipulating workers and only presenting management's viewpoints.

Insofar as scientific analysis is concerned, Social Action theorists believe that meaningful human action can only be explained and understood by examining the rules, artifacts and language used by a particular group or society. Methods of analysis consist of participant observation, qualitative methods, hermeneutics, historical and processual studies, with a view to explaining the meaning of action in a specific context. This obviously leads to rejection of comparative methods, quantification, operationalized variables, questionnaires, and other organizational measurement tools.

The Social Action critics maintain that each individual has a view of the situation which is coloured by his personal interests, and the differing interests of individuals is the basis of conflict. Often the structural form and configuration that an organization

assumes is a reflection of the conflicts and compromises between groups and individuals. This, the critics argue, is a better model for describing both structure and organizational change. (Donaldson, 1985.)

7.2 The Assault: Radical Structuralism.

The other main source of attack of orthodox Organization Theory comes from radical structuralism, or neo-Marxism, theorists who believe that Organization Theory fails to locate the organization in the broader social structure of society. They believe that society is characterized by inequities and oppression and that organizations should be analysed in terms of their contributory role in this oppressive social system.

Neo-Marxians expand on the Social Action theorist's concepts of interest, power and conflict by emphasizing the way in which organizations apparently work to exploit and manipulate their members.

The neo-Marxians' organizational analysis is expressed in terms of class struggle, and imperial and government systems. The motives of the principal actors can be expressed in terms of Marxian political economic theory, regardless of whether the individual perceives it that way or not. So the objective interest of capitalists is to maximize profits and minimize wages, while the objective interest of workers is the opposite. Power differences are expressed in terms of structure which seeks to dominate and exploit. Conflict and raised consciousness of the working classes will ultimately result in massive social transformation - the revolution of the proletariat. For the neo-Marxian the organization must be explained in terms of this conflict model. Regular Organization Theory is just another tool for domination, subjugation, and exploitation. (Donaldson, 1985: 123-135.)

7.3 The Riposte.

In replying to the critics, Donaldson (1985) traced the history of Organization Theory and its split with Sociology. He argued that the growing influence of Social Action and Marxist theories was undesirable and the lack of effective counter argument negligent on the part of organization theorists. His book had been written with a view to not only halting the critical trend but reversing it.

Looking first at social Action theory, Donaldson (1985: 107-113) noted that its atomistic view of society overstated individual will, under-rated the importance of socio-economic determinants, and completely ignored cognitive processes that are not strictly rational.

Nevertheless, Donaldson (1985: 113) was careful to acknowledge the utility of Social Action Theory in explaining differing perceptions, beliefs and values; and perceived interests and conflict. However, its explanatory power was limited and its generalizability restricted. He believed that it was a "primitive theory, leading to low level, unconnected, localized generalizations" (Donaldson, 1985: 113.)

Turning to the neo-Marxian theorists, Donaldson (1985: 123-134) maintained that Marxian sociology was not an organization theory at all and could not, therefore, be used to displace orthodox Organization Theory. The level of analysis of the two approaches was totally different and so they were not mutually exclusive. Attempts to build an Organization Theory that was Marxian had resulted in perspectives that were conventional sociology of a neo-Weberian variety and which were quite compatible with normal Organization Theory. Because Marxism is not an Organization Theory it cannot be used to explain organizational concepts.

In a follow-up to his book, Donaldson (1988) pursued the theme of apparently irreconcilable paradigms and stated that, in his view, they were often not incommensurable. The concepts, theories, metatheories, and epistemologies, were, rather, references to a variety of dependent or independent variables.

> The lessons of recent organization structure research is that simple, general, functionalist-positivist theories can prove to be robust and powerful if the analysis is prosecuted, rather than being dissipated in a confusion of theories and factors.
> (Donaldson, 1985: 32)

8. RECONCILING DIVERGENT VIEWPOINTS.

From the foregoing discussion of Donaldson's work as well as the wide range of structural viewpoints drawn from many divergent disciplines - of which a small cross-section has been presented in this chapter - it must seem that there is more discord than agreement among theorists in the field of *Organization Theory*. Nevertheless, there have been several notable attempts to reconcile these apparent divisions. On page 64 of this study the concept of Paradox in *Organization Theory* was examined in the context of harnessing the seeming contradictions in various theoretical viewpoints in such a way that their explanatory power was enhanced and complemented.

Astley and Graham (1983 : 245-273) further built upon these concepts and have developed a model which achieves a partial reconciliation between theoretically compartmentalized and apparently contradictory points of departure. They began their analysis by outlining six questions on the nature of organization structure that currently predominate in the literature:

(i) Are organizations functionally rational, technically constrained systems; or are they socially constructed, subjectively meaningful embodiments of individual action?

(ii) Are changes in organizational forms explained by internal adaptation, or by environmental selection?

(iii) *Is organizational life determined by intractable environmental constraints; or is it actively created through strategic managerial choices?*

(iv) *Is the environment to be viewed as a simple aggregation of organizations governed by external economic forces, or as an integrated collectivity of organizations governed by its own internal social and political forces?*

(v) *Is organizational behaviour principally concerned with individual or collective action?*

(vi) *Are organizations neutral technical instruments engineered to achieve a goal, or are they institutionalized manifestations of the vested interests and power structure of the wider society?*

Astley and Graham said that no complete resolution of these questions is ever likely to come about, but some integration is possible if it is accepted that different perspectives can present totally different pictures of the same organizational phenomenon without negating each other. To illustrate the major theoretical viewpoints at a metatheoretical level, the authors devised a matrix across two analytical dimensions : (i) the level of organizational analysis, and (ii) the degree to which human nature is seen to be deterministic or voluntaristic. The following discussion is based entirely on their dialectic approach to Organization Theory models. (Astley and Graham, 1983 : 245-273).

The resultant four basic views of Organization Theory can be seen in figure 3.1. It will be seen that this model presents a format into which all of the Organization Perspectives that have been discussed in this chapter can be fitted with a certain amount of ease. Each of the quadrants is self explanatory but provides only a partial explanation of reality. Together they provide an accumulation of complimentary ways to address organizational phenomena and this is accomplished by sequentially juxtaposing the four viewpoints until all six possible combinations have been counterposed and contrasted.

8.1 System versus Action : Q1 vs Q2.

Are organizations functionally rational, technically constrained systems; or are they socially constructed, subjectively . meaningful

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NATURAL SELECTION VIEW	COLLECTIVE–ACTION VIEW
Schools : Population ecology, industrial economics, economic history.	*Schools :* Human Ecology, political economy, pluralism.
Structure : Environmental competition and carrying capacity predefine niches. Industrial structure is economically and technically determined.	*Structure :* Communities or networks of semi–autonomous partisan groups that interact to modify or construct their collective environment, rules, options. Organization is collective–action controlling, liberating, and expanding individual action.
Change : A natural evolution of environmental variation, selection and retention. The economic context circumscribes the direction and extent of organi–zation growth.	*Change :* Collective bargaining, conflict, negotiation, and compromise through partisan mutual adjustments.
Behaviour : Random, natural, or economic environmental selection.	*Behaviour :* Reasonable, collectively constructed, and politically negotiated orders.
Manager Role : Inactive	*Manager Role :* Interactive.
Q3	Q4
Q1	Q2
SYSTEMS–STRUCTURAL VIEW	STRATEGIC CHOICE VIEW
Schools : Systems theory, structural functionalism, contingency theory.	*Schools :* Action theory, contemporary decision theory, strategic management.
Structure : Roles and positions hierarchically arranged to efficiently achieve the function of the system.	*Structure :* People and their relationships organized and socialized to serve the choices and purposes of people in power.
Change : Divide and integrate roles to adapt subsystems to changes in environment, technology, size, and resource needs.	*Change :* Environment and structure are enacted and embody the meanings of action of people in power.
Behaviour : Determined, constrained and adaptive.	*Behaviour :* Constructed, autonomous and enacted.
Manager Role : Reactive.	*Manager Role :* Proactive.

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DETERMINISTIC ORIENTATION . . . . . VOLUNTARISTIC ORIENTATION

Figure 3.1 Divergent Viewpoints on Organization Structure.

embodiments of individual action? This debate is concerned with the question of whether individual action is the derivative of the social system, or whether the social system is a derivative of

individual action. Reconciliation between these views must recognise that individual action is always in some measure constrained by the rules and norms of the system - or else the system would disintegrate. The individual is free to adopt strategies within the rules of the game since abandoning the game altogether would not serve his interests.

The dichotomy between these viewpoints is also illustrated in the decision-making process and the question of whether decisions are rational, goal directed behaviour, or whether decisions are made after the fact in an attempt to rationalize action that has already occurred.

Another illustration of this system/action debate concerns the environment. One viewpoint holds that the environment has causal primacy and organizations adapt within the contextual constraints acting upon them. The other view is that management has leeway to create and define the organization's environment and to proactively incorporate the environmental elements that they choose. Critical to this choice is the concept of "goodness of fit" between organization context and structure. So, while managers may experience environmental constraints, they may still have a certain amount of choice as to what the constraints are to be.

8.2 Adaptation versus Selection : Q1 vs Q3.

Are changes in organizational forms explained by internal adaptation, or by environmental selection? Historically, the internal adaptation view has been predominant. Based on systems theory and the contingency approach, this view posits that an organization responds to change by modifying and elaborating its structure to maintain an isomorphic relationship with its environment. For example, turbulence in the environment must be matched internally by differentiated and flexible structures if organizational effectiveness is to be preserved.

Population ecologists, on the other hand say that this view exaggerates the degree of freedom individual managers have to adjust structural forms. Sunken costs, political resistance to change, and historical precedence induce structural inertia and if the niche that an organization occupies no longer supports that particular organizational form, it is simply "selected out".

Both the adaptation and selection views are deterministic in their approach but they differ considerably in their level of analysis. The adaptation position is that organizations respond individually to change by fine-tuning themselves to suit the contingencies in the environment. By contrast, the natural selection argument is that no amount of fine-tuning will work if, in the long run, an organization's niche disappears altogether. The focus thus shifts to entire populations of organizations that come and go in surges as complete industries are created and annihilated.

The problem with the natural selection view is that very large organizations do not come and go in waves and are seldom selected out. Herein lies a possible reconciliation of the two viewpoints. Small organizations are at greater risk of being selected out because they normally only occupy one or maybe two niches. Conversely, large organizations are able to spread themselves across several niches and can avoid being selected out by altering portfolios and transferring resources to more profitable niches.

A logical extension to this perspective is the "market failures" perspective. This view proposes that, when markets cease to function properly and no longer optimally allocate scarce resources, a large organization can bring its superior monitoring and control capabilities to bear and restore efficiency. This leads to the growth of large hierarchical organizations that supplant and re-establish the economic rationality that is no longer present in the market. Again, the analysis is at a macro level and extends the natural selection view to large corporations.

The concept of hierarchies supplanting markets can, nevertheless, also be argued from an adaptation context. Hierarchies are not just by-products of market failure that act as alternative mechanisms for distributing economic resources. They could equally be managerial tactics for reducing uncertainty and neutralizing contingencies that threaten the organization. This is particularly so when expansion of operations into the environment is in the direction of crucial contingencies with a view to absorbing environmental elements as a means of protecting the technical core of an organization.

8.3 Constrained Niches versus Enacted Domains : Q2 vs Q3.

Is organizational life determined by intractable environmental constraints; or is it actively created through strategic managerial choices? The argument here is between industrial economics and population ecology on the one hand and strategic management on the other. Industrial economists assume that all firms in an industry will react in a similar way, given a particular set of economic circumstances. Strategic management theorists, however, look more to the individual firm as a unique entity and they emphasize the creativity and vision displayed by organizations in changing the rules of the game to suit their own needs in their particular industries.

The industrial economics view disputes the effectiveness of managerial action and asserts that the forces underlying the emergence and destruction of market niches will always overwhelm strategic managerial action. Conversely, proponents of strategic management maintain that the environment is a domain within which managers enact, define and influence key market forces. Individual organizations employ unique strategies and are able to influence industry structure by, for example, erecting barriers to entry. The market structure then becomes a dependent variable that, over time, reflects the collective strategies of firms in the industry.

Herein lies the possible reconciliation of the two views. The industrial economics and population ecology view attributes to the environment what is actually the result of a collective or population level of analysis. By taking a macro view of the population one automatically foregoes a micro view of individual organizations. Although the actions of one small organization may count for little in the context of long run trends at a collective level of analysis, it would be wrong to argue that this proves the existence of amorphous, invisible forces that determine and shape markets and organizations. This is reinforced by the fact that it is still possible to employ a population level of analysis with a voluntaristic, as opposed to deterministic, orientation; as the following discussion shows.

8.4 Economic Aggregates versus Political Collectivities : Q3 vs Q4.

Is the environment to be viewed as a simple aggregation of organizations governed by external economic forces, or as an integrated collectivity of organizations governed by its own internal social and political forces? Both parts of this question focus on the population as the level of analysis. The themes that are at issue concern, firstly, the definition of what constitutes the "population" and, secondly, whether organization populations are directed by economic or by social and political dynamics.

Population ecologists view the population as an aggregation of relatively homogeneous organizations which share certain elements that constitute a common form. They also share a common vulnerability to the environment and interorganizational relationships are comensalistic and based on economic competition for scarce resources. The view of organizations is of open systems that interact directly with the environment and are influenced by it.

Human ecologists, on the other hand, believe that a population only exists when some sort of corporate wholeness or internal cohesion can be attributed to it. Some organizations become functionally specialized in obtaining resources directly from the environment while others obtain what they need indirectly from boundary spanning organizations. Interorganizational relationships are symbiotic and functionally interdependent and develop on the basis of complimentary differences between heterogeneous units. The view of organizations is of symbiotic networks that have a tendency to closure and thus to isolate the organization from the effects of the environment.

In summary, then, population ecology focuses on the natural environment which is made up of forces beyond the organization's control. Organizations compete for environmental resources and, ultimately, their continued existence is dependent on the natural environment. The dynamic which underlies organizational activity is that of economic competition, and relationships between organizations are mediated by a process akin to Adam Smith's "invisible hand". In contrast, human ecology focuses on the active construction of a proactive social environment that displaces the natural environment as the critical influence. There is symbiotic collusion between organizations which ensures the continued existence of interorganizational networks and organizational survival as a whole. The underlying dynamic here is of social and political, rather than economic, forces. Power plays an explicit role within interorganizational networks. Those closest to the environment exercise the most power because they can control the acquisition and distribution of resources to other members of the network.

The tension between the views of population and human ecologists, respectively, is reflected in a similar debate between industrial economists on one hand and political economists on the other, relating specifically to the dominance of big business at the centre of interorganizational networks. The construction of social networks is one way of protecting an organization from the harsh

realities of the natural environment. Another equally effective way would be to absorb elements of the natural environment and thus obtain control of the environment by eliminating market exchange as means of resource distribution. In both cases it is the political power forces that are emphasised rather than economic forces.

Another view is that it is economic forces, particularly the economic advantages of vertical integration, that have led to the emergence of large scale organizations. Those organizations that did not adjust to changing market and technological conditions by internalizing the environment were unable to compete and were selected out. Of course, this view does not consider the possibility that vertical integration could take place with the more basic aim of strangling competitors' supply lines and dominating distribution outlets. While economic factors may provide the necessary conditions to permit vertical integration, it is power and market control that provide the motivation for it to take place.

Taken as a whole, the disparate views of organizational analysis at the macro level of investigation can be reconciled along three complementary and dialectic dimensions: industrial concentration is hegemonic power; economic success is political domination; corporate organization is social control.

8.5 Individual versus Collective Action : Q2 vs Q4.

Is organizational behaviour principally concerned with individual or collective action? This question focuses on the basic tension between self and collective frames of reference. Historically, organization and management theories have tended to accentuate self interest and rationality as their point of departure. Individuals and organizations are credited with having clearly defined objectives and a consistent preference order by which actions that maximize the self interest of the organization are judged. This concept is based on the premise that individual organization

members have shared common goals. Where there are conflicting goals, a number of pressures are brought to bear to achieve consensus : remuneration, promotion and reward, as well as elaborate evaluative and motivational systems.

Critics of this view argue that there is no rational justification for individuals to contribute to the collective good. In small groups individuals may be willing to subordinate their own goals for the sake of reciprocity, trust, friendship, social pressure or altruistic concern for the group as a whole. In larger groups, though, these pressures towards conformity are less pronounced and there is greater difficulty in generating collective actions. Ultimately, individuals will pursue their own goals and will maximize their own self-interest Consequently, conflict and disruption are as omnipresent as consensus and order.

However, the question remains: if organizations represent sectional interests of individuals, why do the individuals bother to adhere to collective working rules at all? The answer lies in the interactions of members of the organization. As expedient response patterns are discovered through trial and error, the successful ones tend to be repeated and then generalized to similar situations. Eventually, individuals who consistently interact come to realize that there is "a way we do things around here." Norms become dissociated from specific situations from which they first arose and are generalized to cover broad areas of collective activity. Ultimately, these norms are imbued with a sense of moral obligation, thus freeing the individual from the need to initiate new response patterns for each situation that he encounters. It is also in this context that we can speak of organizational culture.

So the self or collective action dichotomy, ultimately, is reconciled by recognising that organizational members are both independent actors and involved members of a larger organization. On the one hand they act individually to maximise their own self interest, but, on the other hand, they do also adhere to unifying

patterns of cultural and social norms as they take on responsibilities as part of a larger social entity.

8.6 Organization versus Institution : Q1 vs Q4.

Are organizations neutral technical instruments engineered to achieve a goal, or are they institutionalized manifestations of the vested interests and power structure of the wider society? The point of departure for this debate is encapsulated in the distinction between an "organization" and an "institution". In this context, organizations can be seen as rational man-made creations that are designed to efficiently mobilize activity to achieve prescribed goals. As such, they can be seen as technical instruments or tools that are ultimately expendable.

Institutions, on the other hand, are imbued with a value beyond that of the technical requirements of goal attainment. They are responsive-adaptive organisms that grow according to the social demands and forces that fashion and form them. As such, they reflect the vested interests of the society that spawned them and they mirror the norms and values of the societal structures in which they are embedded.

The idea of organizations as rational, technical tools is the one that has had most currency in organizational literature. The most strident attacks against this concept have come from radical Marxist and political economy theorists. These theorists reject the notion of rational logic and technical effectiveness and maintain that these concepts are ideologies that support and disguise the repressive machinations of a managerial elite bent on exploiting the workers. The conventional arguments in favour of capitalist efficiency are refuted by the assertion that efficiency is defined with a management bias and represents nothing for workers except exploitation and domination.

In this context, worker-management relations are nothing more than a microcosm of the larger class conflict in society. In taking such a standpoint, the radical Marxists and Political Economists go beyond the realms of Organization Theory, as was made clear in the earlier discussion of Donaldson's work. While Marx emphasized discord and struggle between classes, he underplayed the importance of the forces of cohesion and solidarity within classes. Nevertheless, there is a measure of reconciliation between the two viewpoints in the recognition that as the analysis proceeds from the micro to the macro level the forces that underlie organization and structure tend to be more political than adaptive.

8.7 Discussion.

This concludes the discussion of Astley and Van de Ven's (1983) model which attempted to reconcile the major perspectives in Organization Theory. In their treatise the authors went on to contrast the left and right sides (structural forms and personnel actions), and the top and bottom halves (Part-whole relationships), of their model. They concluded that in order to have a proper understanding of Organization Theory, it was necessary to recognize the discipline's basically antithetical nature. "Contradictions are pervasive in organizations and theories that capture discrete segments of organizational life must also inevitably be contradictory and can be reconciled only dialectically." (Astley and Van de Ven, 1983 : 269).

9. SUMMARY.

In this second chapter dealing with the related literature and research into the field of Organization Theory the current state of the discipline was summarised. The newest contributions which re-evaluate Organization Theory's traditional points of departure were described including a re-examination of open systems theory and the structural imperatives employed by contingency theory.

The structural issues that occur in high technology organizations were explored separately and a modern response in the form of the stratocracy was described. Organization Theory issues that occur in societies that cannot be described as advanced Western economies were also described.

Finally, the major academic assaults on classical Organization Theory were outlined and then a framework for resolving the divergent opinions in the field was put forward. This framework proposed a model which described nearly all the major viewpoints along two axes: (i) the level of organizational analysis, and (ii) the degree to which human nature is seen to be deterministic or voluntaristic.

This chapter concludes the examination of the background, theoretical basis and academic foundations of this study. In the following chapters the research methodology that was used will be described and some attention will be paid to the research design and key concepts and definitions. Thereafter the actual collection of data and the research population will be described before moving on to discuss how the data were treated and processed. Finally, the key statistical associations and findings of this study will be described and some suggestions for future research will be suggested.

CHAPTER FOUR : RESEARCH DESIGN.

1. INTRODUCTION.

The research methods and designs employed by Organization Theorists are strongly steeped in the traditions of the behavioural sciences and sociological research methods. This is hardly surprising since - as was pointed out in chapter one - the discipline grew out of, and some believe it is still firmly rooted in, the behavioural sciences. There is, therefore, a robust concern for the validity and reliability of research findings, and a critical approach to the various research strategies and methods is encouraged.

It is axiomatic, then, that classical Organization Theory literature and texts lay strong emphasis on quantitative techniques and the scientific method.

2. THE SCIENTIFIC METHOD.

Conceptually, the scientific method can be illustrated as in figure 4.1 below.

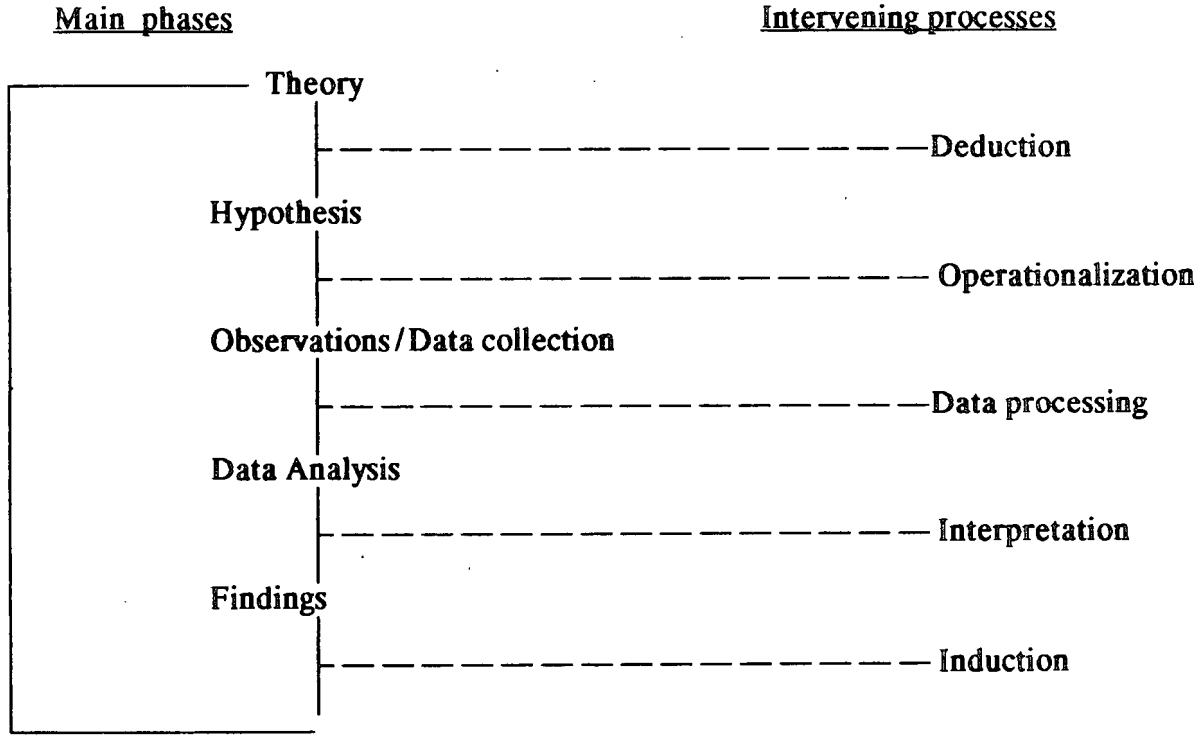

Figure 4.1. The Scientific Method (from : Bryman, 1989: 7)

Leedy (1989 : 80) defined the scientific method as, "...a means whereby an undiscovered truth is sought by (1) identifying the problem that defines the goal of the quest, (2) gathering data with the hope of resolving the problem, (3) positioning a hypothesis both as a logical means of locating the data and as an aid to resolving the problem, and (4) empirically testing the hypothesis by processing and interpreting the data to...resolve the question that initiated the research."

A key objective of this study was to preserve the principles of the scientific method and to follow the steps and phases that are outlined in figure 4.1. This process included gathering, processing and interpreting quantitative data and then testing specific hypotheses which were grounded on accepted theoretical foundations.

2.1 Research design.

Podsakoff and Dalton (1987), in a review of the research methodology used in organization studies, pointed out that certain quantitative methods have become preferred and, through sheer repetition, have become entrenched - despite the sometimes apparent shortcomings of some of them.

This research, for the most part, followed the traditional methods. Because of its seminal nature in the South African context, it did not become involved in the higher order methodological debate. That, perhaps, will be the domain of a later exercise. So, for the purpose of this study it was accepted that:

(i) the data was cross-sectional and not longitudinal,
(ii) it was not possible to cross-validate findings with any other South African study, and
(iii) many of the variables were tested for construct validity in a local situation for the first time.

2.1.1 Research Design of this Study.

There are a number of options that can be followed in putting together a research design; illustrated in figure 4.1. below.

DESIGNS	METHODS
D1 Experiment (major distinctions : laboratory & field experiments; experiments and quasi-experiments)	M1 Self-administered questionnaire
	M2 Structured interview
D2 Survey (including longitudinal survey design)	M3 Participant observation
D3 Qualitative research	M4 Unstructured Interview -ing
D4 Case study	M5 Structured observation
D5 Action Research	M6 Simulation
	M7 Archival sources of data

Figure 4.2. Main research designs & methods in organizational research. (source : Bryman, 1989 : 29)

Following the outline of the main research designs and methods proposed by Bryman (1989) the structure of this study consisted

mainly of design D2 (Survey), together with limited elements of D3 (Qualitative) and D4 (Case Study) designs, respectively.

As to methods, the majority of data was gathered by means of M1 (Self-administered questionnaire). There was also some use of M7 (Archival) data, for example in the search of related literature, and M4 (Unstructured interviews). The latter included discussions that were held with Mr Dirk Desmet, the general secretary of the Electronics Industries Federation; Mr Gerard Morse, senior general manager and head of the Industrial Development Corporation's standing committee on the Electronics Industry; and, finally, Professor David Jacobson, Technology Executive for the Allied Electronics Group and past president of the South African Institute of Electrical Engineers. All of these interviews were conducted primarily to cast light on the questions in the electronics industry that originally triggered this research.

2.1.2 Institutional versus Questionnaire Measures.

Some writers, e.g. Sathe (1978), Ford (1979), Lincoln and Zeitz (1980), have drawn a distinction between what they termed institutional measures of organizations - such as charts, documents and interviews with key informants - and questionnaire measures of organization, in which sample data are gathered from organization members and are then aggregated in order to obtain measures of structure.

The contention is that institutional measures gauge the *designed* or actual organization, while questionnaire measures gauge the *emergent* or experienced organization. The debate as to the degree of convergence between the two has been spirited - although Ford (1979 : 601-610) maintains that the emergent organization will, over time, become the designed organization as behaviour and response patterns are institutionalized into the organization culture.

This study made use of mainly questionnaire measures, with limited institutional measures confined to aspects such as size, ownership, and configuration. However, because the level of analysis was the organizations that comprised the manufacturing industry, and the respondents consisted of one key informant in each organization, the level of aggregation was the industry and not the individual firms. Thus the dichotomy between the emergent organization and the designed organization was probably not as pronounced and should not have impacted unduly on correlations between variables.

2.1.3. Relevance of the Research

Considerations of the relevance of the research are of critical importance and should be built into the research project at the design stage. Thomas and Tymon (1982 : 345-352) proposed a five-point checklist, using the practitioner as the ultimate point of reference.

(i) ***Descriptive relevance*** refers to the accuracy of research findings in describing phenomena actually experienced in an organizational setting.

(ii) ***Goal relevance*** is the degree to which the dependent variables correspond to things the practitioner wants to influence. Research is likely to be useful to practitioners only if dependent variables (outcomes) are of concern to the practitioner.

(iii) ***Operational validity*** - the ability of the practitioner to manipulate causal or independent variables in order to effect change in the dependent variables. Some research, although descriptively valid, is of limited applied relevance because manipulating independent variables would have catastrophic consequences for the organization.

(iv) ***Non-obviousness*** is the degree to which theory meets or exceeds the common sense applications already employed by the practitioner.

(v) ***Timeliness*** - to be of use to the practitioner, theory must be available in time to deal with problems.

As this study progressed, the above principles were regularly reviewed and adherence to them evaluated. Taken as a whole, the following comments can be made :

(i) ***Descriptive relevance.*** Organization Theory principals and measures are well established in advanced economies. The generalizability of particularly the Aston methodology (Hickson and McMillan, 1981) has also been demonstrated in cross-cultural studies, and now also in South Africa.

(ii) ***Goal relevance.*** The dependent (outcome) variables are discussed in detail in section 3 of the next chapter. It is considered that most, if not all, would be of concern to the practitioner at various stages.

(iii) ***Operational validity.*** Independent variables are also discussed below. It is within the bounds of the practitioner to exercise varying degrees of influence on all of them. They are often incorporated into a company's strategic options with a view to gaining competitive advantage by establishing control over them.

(iv) ***Non-obviousness.*** The relationships between variables became clearer as the study progressed. As was expected, the conventional wisdom did not always apply - as was the case with the electronics Industry and certain sectors of the manufacturing industry.

(v) ***Timeliness.*** The timeliness of this exercise could not have been better. With the macro-political and economic changes that have taken place together with increasing global competition, organizational issues have assumed compelling importance.

3. SUMMARY.

The research design of this study was strongly based on the practical application of the scientific method. This entailed an empirical approach with a strong quantitative bias. Data were gathered in a structured manner with a view to testing specific hypotheses based on defined research problems, which were, in turn, drawn from a body of accepted theory.

Criteria for establishing and evaluating relevance were identified and were regularly reviewed with a view to preventing the study from becoming a self-indulgent and valueless exercise.

In the following chapter the key concepts are isolated and examined and those that were measured are operationally defined.

CHAPTER FIVE : KEY CONCEPTS AND DEFINITIONS.

1. INTRODUCTION.

In an earlier chapter a brief history of the development of Organization Theory was sketched. The pioneering research in the 1960s and 1970s of a group led by Derick Pugh in Birmingham, England, was described. These researchers, who became known as the Aston group, were the first to operationalize and measure abstract dimensions of organization structure. Previously, all Organization Theory had been rooted in Weberian Bureaucracy and academic discussion centred around hypothetical constructs, ideal types, and individual case study.

The Aston methodology broke free from the bonds of *a priori* theorizing and armchair speculation and put Organization Theory on a new and empirical footing. Their research has been duplicated, enlarged and developed throughout the world in the intervening 25-odd years.

This study reflects the ongoing development of Organization Theory in that, of the 25 scales that comprise the Questionnaire that was used, less than half represented the original Aston scales. The majority are improvements by later researchers or entirely new scales. Nevertheless, the influence of the work of the Aston group on this project is still considerable.

In the following sections the key concepts are discussed and operationally defined, beginning with a number of independent or causal variables. Secondly, several dependent or outcome variables are discussed and operational definitions for them will also be proposed.

2. INDEPENDENT VARIABLES.

Most organization studies have distilled a number of exogenous variables which have been used in similar research in many countries throughout the world. This study followed the trend and made use of the five most commonly cited exogenous, or independent, variables. They are:

(i) Size
(ii) Technology
(iii) Dependence on other organizations
(iv) Power control, and
(v) Environmental uncertainty or turbulence.

There are, certainly, other variables that could have been considered such as age and life cycle stage, government influence, environmental munificence, cultural pressures, and so on. Some of these were given peripheral consideration. However, the above five have evolved into the core causal variables and other factors tend to be situational and useful for specific studies of limited scope.

2.1. Organizational Size.

The importance that the role of size plays in determining an organization's structure has been widely debated. There is general agreement that the causal link between size and structure is strong; but whether it is overriding, or just contributory, is still unresolved.

2.1.1. Operationalizing Size.

Organizational size can be measured in any one of a number of different ways depending on the application that is required. These could range from measures of turnover, profits, assets, salary bill, and acreage, to a simple headcount. The latter measure has in fact been found to the most effective for organizational research. Size according to headcount has two aspects, firstly the size of the organization under study and then the size of the holding group. In this study, the size of the organizations varied from a minimum of 150 to several thousand. To overcome possible problems associated with such a wide range, size was expressed as the logarithm of the headcount.

Similarly, the wide range of sizes associated with each organization's holding group was overcome by expressing the size of the organization as a percentage of the total holding group. This statistic was also more useful when it was factored into the causal variable of Dependence.

2.2. Technology.

The early debate in Organization Theory centred on the relative importance of size versus technology as the *only* structural imperative. Woodward (1959) argued strongly for an exclusive technology imperative, claiming that only differences in technology, and not other variables, were related to differences in structure.

Technology refers to the process whereby an organization converts inputs into outputs. The concept has a much broader application than just manufacturing. It can be applied to virtually any organization and embraces operations technology, knowledge technology, service technology and materials technology, to name but a few.

2.2.1. Operationalizing Technology.

A common theme that emerges in discussions of technology is the degree to which it has been automated and the amount of routine that it contains. Related concepts are the amount of rigidity or flexibility of throughputs, and the continuity of the units of throughput.

The Aston researchers developed the concept of *automaticity* to encompass these aspects (Pugh & Hickson, 1976). Their scale consisted of two measures - one which rated the most automated single piece of equipment and another which assessed the bulk of the equipment. The automaticity score is the sum of the two. Used in conjunction with other measures, such as the Khandwalla process technology scale (discussed in chapter six),

the Aston scale has proved quite effective.

2.3. Dependence.

Dependance refers to the extent that an organization is reliant on other organizations in its operating environment. This reliance, or dependence, has two forms: firstly, interorganizational dependence with other players in its operating domain such as suppliers, customers and competitors; and secondly, intraorganizational dependence - meaning its relationship with its owning group and the status, accountability, and origin of the organization itself.

Intraorganizational dependence is likely to have more of an effect on structure. It was difficult to test interorganizational dependence because of the sensitivity of the data that was required. Some attempt was still made by including 2 short Aston scales in the demographics section of the Questionnaire.

2.3.1. Operationalizing Dependence.

Intraorganizational dependence was a composite measure derived from four factors :

(i) rating the degree of personalization of the organization's origin,

(ii) rating its status according to whether it is a branch or principal unit,

(iii) rating its public accountability, and finally,

(iv) rating its size as a percentage of the owning group.

Interorganizational dependence was a simple rating measure of the amount of integration with suppliers or customers.

2.4. Power Control.

The power control variable is one that has come into vogue only in

recent times and was not considered by the Aston group and their contemporaries. Power control as a structural imperative looks at the organization purely in terms of those in power, the dominant coalition, selecting a structure that will maximize their control. This viewpoint postulates that the dominant coalition is not necessarily synonymous with those who hold formal authority, and decision making is always self-serving - even if it is couched in terms of maximizing organizational effectiveness. (Robbins, 1987 : 176-200).

2.4.1. Operationalizing Power Control.

An extensive literature search failed to reveal a worthwhile gauge of power control. Pennings (1987: 223-240) suggested that power control is the inverse of dependence, and so the negative correlation between them should be strong. But this was not really an effective measure of the power control variable, *per se*. Accordingly, a perceptual scale was devised, based on Robbins' (1987) definition, in which the presence or absence of 5 different factors was assessed.

The 5 factors were: (i) structural choices to enhance power, (ii) structural constancy, (iii) self serving ideas, (iv) occasionally illogical strategies, (v) a dominant coalition differing from the formal authority structure.

2.5. Environmental Uncertainty/Turbulence.

The best measures of environmental uncertainty and turbulence take cognisance of historical trends and factor in the predictability, frequency and amplitude of environmental change. Such comprehensive measures are, unfortunately, predicated on longitudinal data and were, therefore, not possible in this study.

In keeping with the cross-sectional nature of this study, environmental turbulence was a snapshot impression gleaned from a number of

respondents at a particular moment in time. No doubt the aggregation of data enhanced the validity of this type of measure.

2.5.1. Operationalizing Uncertainty/Turbulence.

Once again perceptual measures were employed. Firstly, respondents estimated the impact on their organizations of sociopolitical and economic changes, and changes in work methods and techniques. Secondly, a measure of the predictability of 8 environmental influences was employed. These encompassed operations technology, competitors' actions, market demand, product attributes, raw material availability, government regulations, labour union actions, and raw material prices. Finally, a scale based on the research of Anshoff and Sullivan (1993) measured environmental change in terms of its familiarity, rapidity, visibility, and complexity.

3. DEPENDENT VARIABLES.

A number of dependent or outcome variables have, again, through custom and practice become entrenched as the core variables in organization studies. These include the classic bureaucratic dimensions of specialization, standardization, formalization and centralization. A factor analysis performed by the Aston researchers found that specialization, standardization and formalization were actually composite variables of an underlying factor grouping which they dubbed Structuring of Activities. (Pugh et al, 1968). Centralization formed part of a second factor grouping which they called Concentration of Authority.

Other outcome variables which were used in this study included measures of configuration and span of control; measures of organic or mechanistic structure after Burns and Stalker (1961); and, finally, measures of organizational climate drawn from Payne and Phesey's (1971) Business Organizational Climate Index, or BOCI.

3.1. Structuring of Activities.

The constituent elements of the structuring of activities dependent variable are :

- *specialization,* or the division of labour in an organization
- *standardization,* or the existence of rules that cover all circumstances and that apply invariably
- *formalization,* or the extent to which rules, procedures, instructions and communications are written down.

Intrinsically, formalization and standardization are two side of the same coin, with formalization being an indication of the extent to which standardization is committed to writing.

3.1.1. Operationalizing Structuring of Activities.

Structuring of activities was operationalized mainly by institutional measures. These consisted, firstly, of a straightforward count from a predetermined list of the number of specializations in the organization. Secondly, the number, type, usage and distribution of documents was determined to gauge the amount of formalization, also by means of a simple count from a predetermined list.

These measures were backed up by a simple perceptual measure of the degree of standardization in the organization.

3.2. Centralization.

Centralization refers to the locus of decision making and reflects

the degree to which authority is concentrated at high levels within the organization, or rests in controlling units outside the organization. Some studies have also found that distinguishing the nature of decisions was also important. For example, technology as an independent variable will trigger different types of decisions at different levels in the organization. (Azumi and McMillan, 1981).

3.2.1. Operationalizing Centralization.

The operational measure of centralization was primarily an institutional procedure in which decisions from a predetermined list were counted as being taken either within the organization or outside the organization at a level higher than the Chief Executive. In addition, questionnaire measures were used to sift out perceptions of the type of decisions that were centralized and the degree to which operating decisions were centralized.

3.3. Configuration.

Configuration variables relate to the physical shape of the organization's structure. These were, in fact, the first variables of interest to researchers. (Woodward, 1958). They include measures of organizational depth and span, and ratios of production to administrative and support staff.

3.3.1. Operationalizing Configuration.

Operationalized configuration variables consisted of simple counts of the number of levels from the very top to the very bottom of the organization, the number of direct reports to the

CEO, the ratio of direct workers to first line supervisors, and estimates of the percentages of clerical, supervisory and direct workers.

3.4. Organic and Mechanistic Structures.

The differences between organic and mechanistic structures, first outlined by Burns and Stalker (1961), have been discussed at length in organizational literature. They are summarized again below:

CHARACTERISTIC	MECHANISTIC	ORGANIC
Task definition	Rigid	Flexible
Communication	Vertical	Lateral
Formalization	High	Low
Influence	Authority	Expertise
Control	Centralized	Diverse

Figure 5.1. **Mechanistic and Organic Structures. (Robbins, 1987: 154)**

3.4.1. Operationalizing Organic and Mechanistic Structures.

The structuring of activities variables described earlier should, obviously, be strong indicators of the degree to which an organization is mechanistic or organic. In addition, a questionnaire measure (Covin et al, 1990: 507) was used in which the items in figure 5.1. acted as five poles on a continuum to which another 3 items were added : management style, reaction to change, and attitude to procedures.

So the full operational definition of organic/mechanistic structures is as summarized in figure 5.2.

CHARACTERISTIC	MECHANISTIC	ORGANIC
Task definition	Rigid	Flexible
Communication	Vertical	Lateral
Formalization	High	Low
Influence	Authority	Expertise
Control	Centralized	Diverse
Management style	Uniform	Free ranging
Reaction to change	Precedent & principles	Adapting freely
Procedures	Strict adherence	Getting things done

Figure 5.2. **Mechanistic and Organic Structures.**

3.5. Organizational Climate.

The Business Organization Climate Index (BOCI) was devised by Payne and Pheysey (1971) specifically to test for relationships between organizational climate and both the independent and dependent variables of structure. The BOCI looks at the processual aspects of structure and consists of 254 items which fall into 24 conceptual groupings or scales. The scales are broadly classified under six headings : authority, restraint, work interest, personal relations, routine or control, and wider community.

3.5.1. Operationalizing Organizational Climate.

Each of the BOCI scales consists of eight items in the form of a four point scale ranging from definitely true to definitely false. For the purpose of this study, the number of scales was reduced from 24 to 9, giving a total of 72 items. These tested 5 of the 6 categories - excluding the category "wider community orientation", which was not really relevant to this study.

So the nine scales that were used are :

1. **Authority**
   - (i) Leaders' psychological distance
   - (ii) Concern for employee development
   - (iii) Questioning authority
2. **Restraint**
   - (iv) Emotional control
3. **Work Interest**
   - (v) Scientific and technical orientation
   - (vi) Intellectual orientation
4. **Personal Relations**
   - (vii) Interpersonal aggression
5. **Routine**
   - (viii) Rules orientation
   - (ix) Readiness to innovate

The principle of goal relevance discussed in the previous chapter was used to distil these nine scales. There is a good chance that any or all will be of concern to the practitioner.

4. SUMMARY.

In this chapter the key concepts and variables were described and operational definitions were discussed, in keeping with the precepts of

the scientific method. Strong reliance was placed on existing Organization Theory concepts and operational definitions - although no operational description of the power control variable could be found. An original definition for this variable had to be developed.

In the next chapter the methods of gathering data that were used will be outlined and the questionnaire and its composite items will be examined. Brief attention will also be paid to the interview methods and case studies that were used as an adjunct to the questionnaire.

CHAPTER SIX : COLLECTING THE DATA.

1. INTRODUCTION.

Ultimately, this research report will be as legitimate as the data upon which it is based and as reliable and valid as the instruments that collected the data. A number of key issues, therefore, had to be addressed to preserve the integrity of the data collection process.

In the following sections the target population is defined and its general characteristics discussed. Methods of eliciting information from the target population are then considered; the prime method being a comprehensive Questionnaire, which is examined in some detail.

Some limited use was also made of case study and interview techniques which were confined to key informants in high technology industries and to companies in the Allied Electronics group.

2. THE DATA BASE.

The Bureau of Market Research of the University of South Africa has a data base which it calls the Standard Industrial Classification of all Economic activity, or SIC. In the category ***Manufacturing*** there are records of 14 964 organizations, and it was from this data base that the research population was drawn. That the population was confined to manufacturing organizations was a deliberate decision. It was felt that the effects of technology as a causal variable were likely to be significant in manufacturing organizations and, therefore, more apparent and measurable than in, for example, service or retail organizations.

The types of activities embraced by organizations classified under the SIC's heading of Manufacturing includes food, beverages and tobacco; textiles and clothing; wood including furniture; paper, printing and

publishing; industrial chemicals, plastics and refineries; glass and non-metallic substances; iron, steel and non-ferrous metals; and electrical machinery, machinery, motor vehicles, fabricated metal products and scientific equipment. A full breakdown of the number of companies in each activity is provided as Annexure 1.

The geographical dispersion of manufacturing organizations in the SIC's data base is illustrated in figure 6.1. below. Although the areas are based on designations prior to the recent provincial demarcations, the geographical groupings employed are, nevertheless, quite analogous to the nine new provinces of South Africa.

Geographical Area	Number	%
Cape	2 282	16,6
Northern Cape	235	1,6
Orange Free State and Qwa Qwa	537	3,6
Eastern Province	968	6,5
Natal and KwaZulu	2 644	17,7
Eastern Transvaal and KaNgwane	444	2,9
Northern Transvaal, Gazankulu & Lebowa	303	2,0
PWV and KwaNdebele	6 732	45,0
Western Transvaal	348	2,3
Other	269	1,8
Totals	14 964	100,0

Figure 6.1. Geographical dispersion of SIC manufacturing organizations.

It will be seen that the regions of the Cape, Natal KwaZulu, and the PWV (Gauteng) between them account for 80% of all manufacturing activity, with Gauteng alone soaking up 45%.

2.1. The Research Population.

Bureaucratic mechanisms and strategies for exercising structural control will be more evident in organizations that are older and larger. Nearly all organizational studies have found size to be one of the most important exogenous variables. It follows, then, that the organizations that comprised the population for this study had to be of a reasonable size for the effects of size to be present. It was decided that the cut-off size would be 150 employees for an organization to be included in the population. Figure 6.2. is a summary of the number of organizations in the SIC Manufacturing category that had a headcount of 150 or more.

Number of Employees			Number	Cumulative	
				Number	%
151	to	200	540	540	22,68
201	to	300	606	1 146	48,15
301	to	400	341	1 487	62,48
401	to	500	230	1 717	72,14
501	to	600	140	1 857	78,03
601	to	800	194	2 051	86,18
801	to	1 000	87	2 138	89,83
1 001	to	1 500	128	2 266	95,21
1 501	to	3 000	77	2 343	98,45
3 001	to	5 000	23	2 366	99,41
5 001+			14	2 380	100,00
Total			2 380		

Figure 6.2. SIC Manufacturing organizations with more than 150 employees.

Of the total of 2 380 manufacturing organizations, there were 2 288 that were suitable for inclusion in the research population. Each of

these organizations was contacted and the total number of responses from this population then became the research sample.

2.2. Overcoming Sampling Bias.

By including all of the organizations from the SIC data base that comply with the criteria of (i) falling into the manufacturing category, and (ii) having more than 150 employees - i.e. a complete census, and not a smaller, stratified sample - it was considered that problems associated with sampling bias would be overcome. The analysis in the following sections seems to indicate that this was indeed the case and the eventual aggregate of respondents which would comprise the research sample was clearly representative of the research population.

A final factor affecting possible bias has to do with the integrity of the Bureau of Market Research's SIC data base. Assurances were given by the Bureau that their data base is the largest and most current of its kind in South Africa, outside of the bureau of statistics of the Department of Manpower.

2.3: Characteristics of the Sample and the Population.

The SIC data base provides three key parameters by which constituent organizations can be described and compared. They are: the size of the organization, the development region in which it is situated, and, finally, its type of activity as indicated by its SIC code.

It was felt that a reasonably high response rate of 528 returned questionnaires enhanced the representativeness and generalizability of the data. The raw data upon which the following analysis and graphs are based is contained in annexure 2. The criteria used for including questionnaires were very strict. If, for example, a respondent failed to complete just one section or scale, the entire questionnaire was discarded. The final number of usable questionnaires was 458 or 22%. Annexure 2 details this computation.

2.3.1 The Size of Organizations in the Sample and the Population.

The size codes that are used by the SIC are set out below :

Size code	Number of Employees
13	151 - 200
14	201 - 300
15	301 - 400
16	401 - 500
17	501 - 600
18	601 - 800
19	801 - 1000
20	1001 - 1500
21	1501 - 3000
22	3001 - 5000
23	5001 +

Using these size codes it was possible to plot a comparative bar chart of the size of organizations in both the sample and the population. This is illustrated in figure 6.3 below.

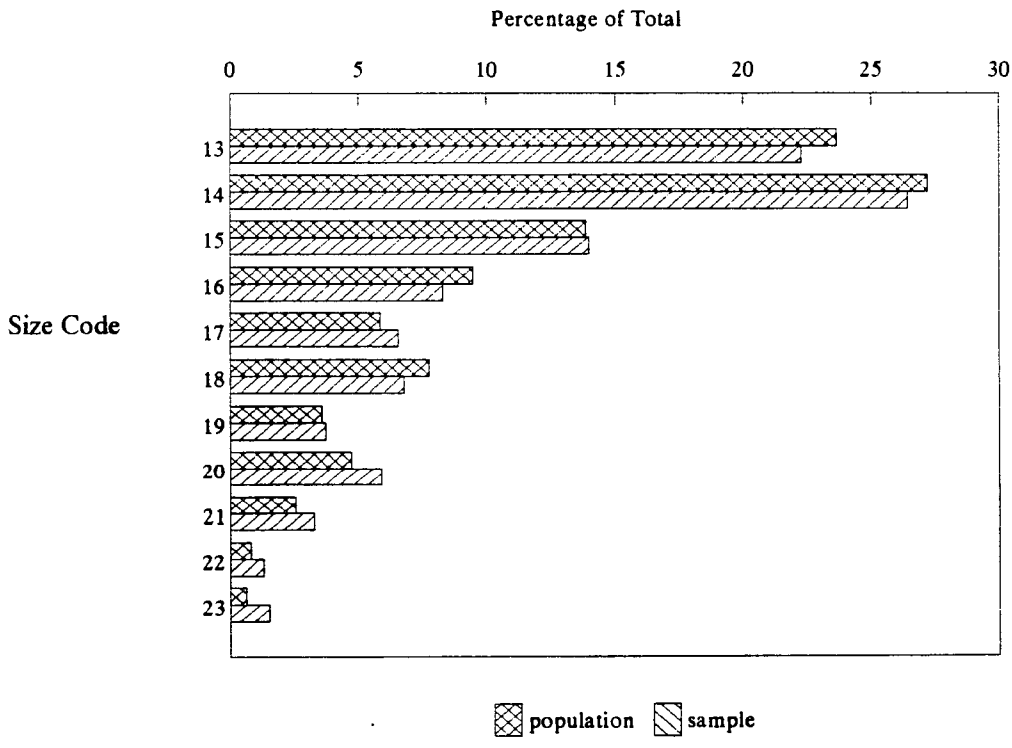

Figure 6.3. Employee size groups of sample and population.

It becomes apparent that the correspondence between the distribution of organizations of a similar size within the sample and the

population was very close. In both cases the majority of organizations fell within the code 14 category, followed by codes 13, 15, and 16, respectively.

The degree to which the size of organizations in the sample can be regarded as predicting the size of organizations in the population can be gauged by the Pearson correlation coefficient between the range of scores in both; which, in this case, was 0,997. This indicated that the association between the sample and the population along the parameter of organization size was almost perfect.

2.3.2. The Type of Industries in the Sample and in the Population.

A similar comparison between the types of industries in both the sample and the population is shown in figure 6.4.

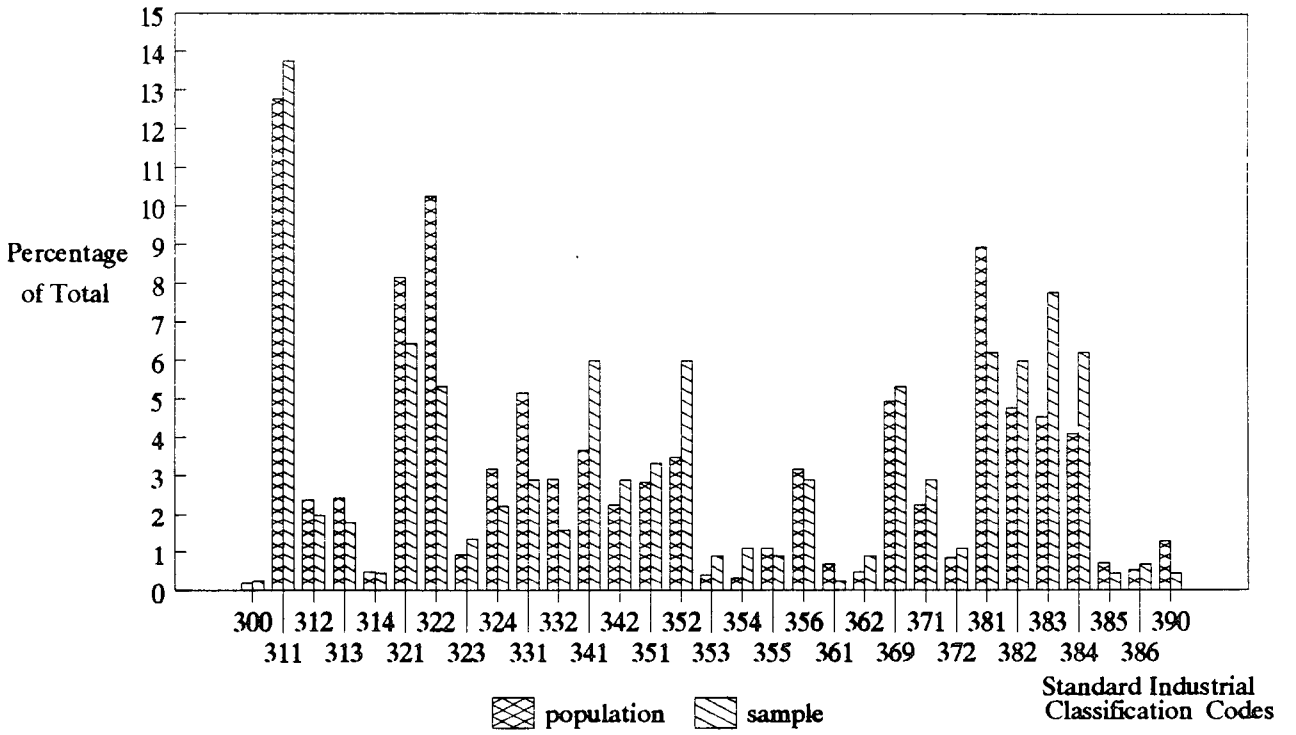

Figure 6.4. Types of industry in the sample and the population.

Although the association between the types of industries that comprise the sample and the population is not as close as that of size; it is, nevertheless, quite compelling with a correlation

coefficient of 0,867.

2.3.3. The Development Regions of the Sample and the Population.

The final comparison between the characteristics of the population and the sample concerns the geographical regions from which they were drawn. This is shown in figure 6.5. below.

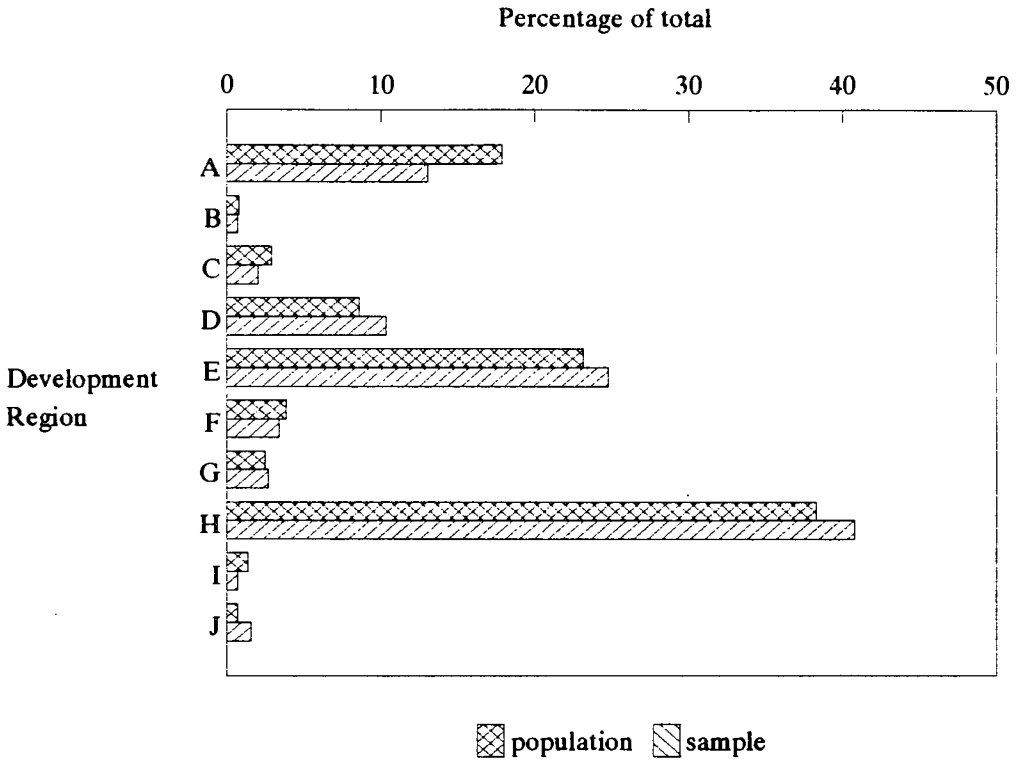

Figure 6.5. Geographic regions of the sample and the population.

It will be seen that the association between the sample and the population with respect to their geographic dispersion throughout the country was also very strong. A correlation coefficient of 0,989 indicated that there is substantial predictability between the two groups along this dimension.

Taken as a whole, then, it can be said with confidence that the sample and the population are comparable along three descriptive dimensions. There is, therefore, ample justification for generalizing the results of this study to the population from which it is drawn.

3. THE QUESTIONNAIRE.

The guiding principle in putting together the Questionnaire (attached to this report as Annexure 3) has been described most effectively by Sudman and Bradburn (1982: 119-120) :

> The best advice we can offer to those starting out to write...questions is to plagiarize. While plagiarism is regarded as a vice in most matters, it is a virtue in questionnaire writing - assuming, of course, that you plagiarize good-quality questions. ...You can spare yourself much agony over the formulation...and extensive pretesting. If the questions have been used frequently before, most of the bugs will have been ironed out of them.

Of course plagiarism is a strong word and implies theft of another's ideas without acknowledgement. This was not the intention of this study and full acknowledgement is given for all scales used and adapted in the Questionnaire.

The following paragraphs will deal with each individual section of the Questionnaire.

3.1. Section 1: Size and Dependence.

All the scales used in the first section were either original Aston measures or modifications of the abbreviated Aston scales. (Inkson et al, 1970). They were designed to put numbers to the independent variables of Size and Dependence. As discussed in the previous chapter, size was expressed as the natural logarithm of total headcount. Dependence was expressed as the sum of the scores on the sub-scales of origin, status, public accountability, and, finally, size relative to owning group.

The Aston model was modified in that a fourth category was added to the public accountability scale - that of ownership by a foreign

multinational. There was obviously no call for such a category in the original British sample. Scoring on the individual items was also different in that, whereas Aston numbered from 0 to 3, this study numbered from 1 to 4. This meant that it was impossible for an organization to score zero for dependence. This apparent anomaly was created because it was considered that respondents may be uncomfortable choosing 0 as an option on the Questionnaire. The original Aston scales were in the form of interview schedules and so this problem did not arise for them.

In any event, for the statistical techniques that were used to test for relationships it was felt that consistency in application and relative scores were more important than absolute scores.

3.1.1. Reliability and Validity.

The developers of the abbreviated scales, Inkson et al (1970), ran tests on the same sample of 52 organizations as the original Aston studies and obtained very high correlations with the original study. Dependence, for example, had a correlation of 0,91 with the original research. Studies throughout the world have demonstrated the replicability and integrity of the Aston measures in general. (Hickson and McMillan, 1981).

3.2. Section 2: Technology.

The measurement of technology has been a contentious issue in organizational research. Consequently, methods and operational definitions have differed widely. It was, therefore, decided to follow the example of the Okayama study (Marsh and Mannari, 1981) and to use two diverse measures: firstly the Aston measure, entitled Workflow Integration, and then a scale called Process Technology, developed by Khandwalla and also used by the Okayama researchers. (Marsh and Mannari, 1981).

Scoring on the workflow integration scale was simply the sum of the responses in the two columns, indicating the automaticity of the bulk of equipment and the most automated single piece of equipment. The score for process technology was arrived at by multiplying the incremental number assigned to each type of technology by the extent of its usage and then summing all of these to obtain an overall score.

3.2.1. Reliability and Validity.

The workflow integration scale has exhibited very high test-retest and unidimensionality coefficients of 0,96 and 0,79, respectively. Factor analysis has revealed a large first factor accounting for 53% of variability, with all items loading significantly on this factor with a mean loading of 0,76. (Stewart et al, 1981: 1.2[1]).

As to the Khandwalla process technology scale, Singh (1985: 800-812), in a critique of the Okayama study, maintained that process technology was actually a better measure than workflow integration and explained 40% more variance.

3.3. Section 3: Structural Control and Environment.

The term structural control was used in preference to power control as it is more neutral and possibly has fewer negative connotations. For this reason the power control scale was also combined with a six-item organization change scale of Lincoln and Zeitz (1980). Items 1 to 9 of section 3.1. comprised the power control scale and items 10 to 15 were the organization change scale. The predictability measure, section 3.2., was taken straight from Robbins (1987: 162) with only minor amendment to the scoring system to make it more explicit.

The Anshoff and Sullivan (1993) scale was reworded to suit an African context and by adding the qualifier "operating" to the word "environment" throughout. This was important because it was felt that the

recent momentous political changes would influence most respondents to rate their environments as being very turbulent. This would obviously skew the measured effect of environment on organization structure. The introduction to this item also attempted to focus respondents' minds on the operating environment, but with limited success. The recent political changes undoubtedly did colour perceptions of the operating environment and this no doubt affected the scale's reliability, as will be seen later in this report.

Scoring on each of the four scales was a straightforward total of the responses checked. Item 4 on the power control scale was negatively keyed.

3.3.1. Reliability and Validity.

Lincoln and Zeitz (1980) unfortunately did not provide any information on their organization change scale, and the power control scale is original and was tested for the first time in this study. Robbins (1987) offered his predictability scale with no comment except to say that it provides a "reasonably good guide" for assessing environmental uncertainty. Anshoff and Sullivan (1993) offered no information on their scale.

3.4. Section 4: Structuring of Activities.

The items in section 4 of the Questionnaire begin to turn the spotlight onto the dependent variables by presenting scales for functional specialization, formalization, standardization and configuration.

The functional specialization scale was a development by Reimann (Stewart et al, 1981) of the original specialization index of the Aston researchers. Formalization was measured by an adaptation of the original Aston scale, as was configuration. The standardization scale was drawn from the work of Hage and Aiken. (Price, 1972: 151).

Scoring of specialization was a simple count of the number of yes responses and formalization was scored as the total of the responses marked. For items 4 to 9 each yes response counted 1. Standardization was scored as the total of the responses; the first and second items were negatively keyed. Finally, the configuration variables were scored as discrete numbers for the first three items and ratios for the second three. No summing of individual items took place in this case.

3.4.1. Reliability and Validity.

On the structuring of activities variables, a test-retest reliability exercise carried out in the United Kingdom displayed a correlation of 0,97. (Inkson et al, 1970). Commenting on Hage and Aiken's standardization scale, Stewart et al (1981 : 2.9[2]) said that, while reliability data was sparse, the scale's validity was good.

3.5. Section 5: Centralization.

Centralization and its relationship to other variables has also been the subject of much debate in Organization Theory circles. The point was made earlier that it is important to distinguish between the types of decisions that are centralized.

To this end, Inkson et al's (1970) autonomy scale was supplemented by two further measures. These were a decision making discretion scale from Robbins (1987) and a policy decision scale by Reimann (Stewart et al, 1981).

Scoring for autonomy was by means of a binary scale, i.e. decisions that are made inside the organization were scored as 1 and decisions made by levels above the chief executive were scored 0. The total score out of 23 indicated the degree of autonomy or decentralization.

Robbins'(1987) decision making and discretion scale consisted of a total of ten 5-point items. The sum of the scores on these items indicated the degree of centralization out of a possible 50.

Finally, Reimann's policy decision making scale also consisted of a total of six 3-point items. There were no negatively keyed items and the total score out of 18 indicated the degree to which authority was concentrated in fewer people at higher levels.

3.5.1. Reliability and Validity.

The autonomy scale has, according to Price (1972: 41-41), been subject to the rigours of test and retest validity and has proven to have high levels of reliability and validity. There was no information available on Robbins' decision making and discretion scale. Reimann's policy decision making scale was described by Stewart et al (1981) as being of acceptable reliability and adequate validity.

3.6. Section 6: Organicity.

The 7-item Organicity scale developed by Covin et al (1990) was based on a similar scale devised by Khandwalla to assess an organization's tendency to organic or mechanistic structure. The mean score across all seven items was the organization's organicity score. The higher the score out of 7, the more organic the organization's structure.

3.6.1. Reliability and Validity.

There was no information available on the organicity scale's reliability and validity. However, it was expected that the items on the scale would be highly correlated with the structuring of activ-

ities variables and one would expect to see a strong negative relationship between the structuring variables and organicity.

3.7. Section 7: Organization Climate.

The nine scales chosen from the 24 comprising the Business Organization Climate Index were combined under a single section of the questionnaire. In all cases, the scales comprised 8 items scored along a 4-point continuum. The scoring system was a simple total of all the responses, with scores for negatively keyed items being reversed. The BOCI scales used are summarized in figure 6.6.

	Scale	Items	Negatively keyed Items
1.	**Authority**		
	Leaders' Psychological Distance	17 to 24	None
	Concern for Employee Involvement	25 to 32	28, 29 and 30
	Questioning Authority	65 to 72	69
2.	**Restraint**		
	Emotional Control	49 to 56	49, 50, 51, 54 & 56
3.	**Work Interest**		
	Scientific & Technical Orientation	1 to 8	3 and 4
	Intellectual Orientation	8 to 16	10, 11 and 12
4.	**Personal Relations**		
	Interpersonal Aggression	41 to 48	42
5.	**Routine**		
	Rules Orientation	57 to 64	60 and 63
	Readiness to Innovate	33 to 40	33, 34, 35, 37 & 39

Figure 6.6. Summary of BOCI scales used in the Questionnaire.

3.7.1. Reliability and Validity.

Stewart et al (1981) have provided extensive information on the

validity and reliability of the BOCI scales. These are summarized below in figure 6.7.

	Scale	Reliability	Validity
1.	**Authority**		
	Leaders' Psychological Distance	poor	acceptable
	Concern for Employee Involvement	good	not clear
	Questioning Authority	acceptable	acceptable
2.	**Restraint**		
	Emotional Control	adequate	unclear
3.	**Work Interest**		
	Scientific & Technical Orientation	good	good
	Intellectual Orientation	good	uncertain
4.	**Personal Relations**		
	Interpersonal Aggression	good	acceptable
5.	**Routine**		
	Readiness to Innovate	good	suspect
	Rules Orientation	acceptable	good

Figure 6.7. Reliability & validity of the BOCI scales (Stewart et al, 1981)

3.8. Section 8: Demographic and Background Information.

Apart from the usual question on the position of the respondent, this section also called for information on the organization's life cycle stage, major industry and sector, age, and approximate turnover. It was felt that any or all of these factors could prove important from the point of view of controlling for extraneous variables - or even testing additional hypotheses that may have occurred in the course of the research. Conceivably, life cycle stage, type of industry, and age of the organization could all have some effect on structuring of activities.

In addition, an abbreviated scale to test for interorganizational or external dependence was included. (Hickson and McMillan, 1981: 202).

The information derived was used to supplement hypotheses testing, using dependence as an independent variable.

3.8.1. Reliability and Validity.

Most of the items in the last section were straightforward institutional measures and were considered, therefore, to be very reliable and valid. Hickson and McMillam (1981) offered their abbreviated measure of external dependence without comment on its reliability or validity. They did say that it was a useful research concept and that organizations in different cultures differed sharply in their reactions to external dependence. (Hickson and McMillan, 1981: 182-183).

3.9. Administration of the Questionnaire.

The questionnaire was printed on good quality paper using a double sided format to minimize its bulk. Labels for the 2288 organizations that comprised the research population were purchased from the Bureau of Market Research and these were affixed to sturdy A4 size envelopes so the questionnaire would not be folded. Each questionnaire was posted together with a carefully drafted covering letter and a stamped return envelope. The covering letter was one page in length and covered the following points :

- what the study is about and its usefulness
- why the respondent is important
- promise of confidentiality and explanation of identification number
- reward for participation
- what to do if questions arise
- thanks to the respondent.

An example of the covering letter is included as annexure 4 to this report.

Some of these points were reiterated in the introduction to the actual questionnaire, and willingness to share the results of the research was communicated both in the covering letter and in the questionnaire.

The data capture of completed questionnaires was carried out by the researcher over a three month period. The format used was a Lotus 123 spreadsheet which is compatible with most statistical software packages. It also allowed for the inclusion of formulae to calculate item totals, to reverse negatively keyed items, and to perform *ad hoc* manipulations of data before they were downloaded onto the statistical software package.

The statistical software package that was used was SPSS/PC+. This package was acquired after extensive consultations with experts in the fields of computer software and statistics. Statisticians from both the Graduate School of Business Leadership as well as the Department of Statistics of the University of South Africa commended the choice of SPSS/PC+ as the software package.

3.10. Pilot Study.

A pilot study was carried out on 23 respondents drawn from various industrial organizations on the East Rand as well as from the membership of management forums to which the writer belongs.

The Questionnaire was generally well received and very few problems were experienced by the participants. The problems that arose were minor and were addressed by rewording the instructions to the Technology scales slightly, and by repositioning the centralization scales. One centralization scale was found to be redundant and was dropped from the final Questionnaire.

4. CASE STUDIES AND INTERVIEWS.

Case study material was assembled and interviews conducted specifically with a view to providing clarity on the research problem which concerned the relationship between organic structures and high tech. industries, which seemed to be different in South Africa than in developed countries.

Case studies were confined to companies in the Allied Electronics group of companies where, because the researcher is an employee of the group, access did not prove to be a problem.

Similarly, interviews were carried out with key informants within the electronics industry. The following persons were approached and indicated their willingness to assist:

(i) Dr David Jacobson, Technology Executive of the Altron group,

(ii) Mr Gerard Morse, Senior General Manager of the Industrial Development Corporation and Chairman of the Standing Committee for the Electronics Industry; and

(iii) Mr Dirk Desmet, General Secretary of the Electronics Industries Federation.

As was anticipated, all of the information elicited by case studies and interviews was qualitative rather than quantitative and did not form part of the quantitative tests for relationships between structural and environmental variables, nor was it be used to test specific hypotheses.

Nevertheless, the qualitative information that was gleaned not only proved interesting in itself but provided some valuable insights and possible explanations for the seeming aberrations within South African Organization Theory.

5. SUMMARY.

This chapter has dealt with the collection of the data. The method that was used to define the research population was described and the method of extracting a representative sample was discussed. The research population comprised the entire SIC data base of 2380 manufacturing organizations who have more than 150 employees, and the research sample was the total of 528 organizations who responded to the questionnaires. An analysis of the characteristics of the sample and the population indicated a high degree of consonance between critical aspects of both groups; giving rise to the assertion that the findings of this research can be generalized to the population with a considerable amount of confidence.

The Questionnaire was considered on an item-by-item basis and the origin of the various measures or scales was discussed, together with the scoring methods for every scale and, where available, information on their reliability and validity was also provided. The results of a pilot study were briefly outlined. Proposed interview and case study methods to elicit qualitative information were also briefly touched on.

In the following chapter the emphasis falls on the quantifiable information which flowed from the questionnaire, and the processing and treatment of the research data is considered in more detail. The chapter consists in large part of a comprehensive item analysis of the scales used in the questionnaire and considerable attention is paid to establishing the reliability, validity, multidimensionality and integrity of the data.

CHAPTER SEVEN : PROCESSING AND TREATMENT OF THE DATA.

1. INTRODUCTION.

The intention of this chapter is to provide a detailed account of the statistical processes and data treatment methods that were used in this study. Although it is important to have an understanding of what statistical procedures to use, when to use them and why one should use them, no claims are made to expertise in how to design and structure sophisticated statistical models. Fortunately, in this day and age the availability of advanced computer software packages has largely taken care of this problem. As was stated earlier, the computer software used in this study was SPSS/PC+ (Statistical Package for the Social Sciences) Release 5.

In the end, though, it is also important to remember that this thesis is about *Organization Theory* and not about statistical methods used in organizational studies.

Even so, a lot of emphasis will be placed on the analysis and evaluation of the measuring instruments. As far as is known, most of the scales were used for the first time in South Africa and some of the modifications and original scales were being used for the first time anywhere.

The following sections will begin by outlining the statistical steps that were followed; before moving on to address the analyses of the results obtained by the various scales. These analyses consist of a tabular framework setting out the critical correlations and factor and item analyses for all the dependent and independent variables. This tabular framework will then be carried over into the next chapter where the relationships postulated in the research hypotheses will be tested.

2. STATISTICAL PROCESSES.

The statistical analyses carried out in this study involved three stages:

(i) testing the reliability and validity of the scales,

(ii) testing the scales for multidimensionality by

searching for underlying factors, and, finally,

(iii) multiple regression analysis of the independent and dependent variables.

Each of these stages is briefly discussed below.

2.1. Reliability of the Scales

Insofar as assessing reliability is concerned, this was accomplished by using either Cronbach's Coefficient Alpha or the Kuder-Richardson Formula 20, depending on whether or not the items on the scale were dichotomous. Estimation of the validity of each scale formed part the factor analysis exercise. See section 2.2. below.

Coefficient Alpha was used for all non-dichotomous items. It is based on the mean split-half correlation coefficient implying all possible permutations of the split half:

$$r_{kk} = \frac{k}{k-1}\left[1 - \frac{\Sigma s_i^2}{s_x^2}\right]$$

where k is the number of items on the scale, Σs_i^2 is the sum of the variance of item scores, and s_x^2 is the variance on all k items on the scale.

The ***Kuder-Richardson Formula 20*** is a widely used index of internal consistency and can be regarded as a special case Coefficient Alpha for items that are scored dichotomously:

$$r_{kk} = \frac{k}{k-1}\left[\frac{s_x^2 - \Sigma p_i q_i}{s_x^2}\right]$$

where

k	=	the number of items on the scale
s_x^2	=	the variance of total scores on the scale
p_i	=	the proportion of positive responses
q_i	=	1 - p_i = the proportion of negative responses

2.2. Multidimensionality and Validity of the Scales.

All of the scales that consisted of a number of composite items were examined to establish the extent to which they included one or more dimensions. Factor analysis was used for this examination. Multidimensionality was expected in the structural and organizational climate scales because they contained items which are grounded in global concepts.

Clark (1990), in a Canadian application of the Aston methodology, said that there are two grounds for distinguishing between Principal Component Analysis (PCA) and Principal Factor Analysis (PFA). Firstly, PCA assumes that all variation can be explained in terms of common factors, whereas PFA assumes that each variable has its own unique variation which cannot be explained in terms of common factors. Secondly, PCA is a data reduction technique whereas PFA describes the data.

Hair *et al* (1979: 224-225) pursued this distinction by describing the variance that is extracted or lost in either method. PCA methods incorporate total variance, which is comprised of three aspects: **common variance**, or the variance in a variable which is shared with all other variables, specific **variance**, or the variance associated with only one variable, and **error variance**, or variance due to data gathering inaccuracies. PFA methods, on the other hand, incorporate only the common variance of the analysis and exclude both the error and specific variances. In practical terms, this is accomplished by inserting communalities in the diagonal of the correlation matrix upon which the factor analysis is based - rather than inserting the more usual unities.

In this study it was decided to use both PCA and PFA methods, as deemed appropriate, with varimax rotated solutions in a search for simple, interpretable factors.

Factor analysis methods were also used to establish the validity of the scales. (Brown, 1976: 132-133). It was possible to assess both their *construct validity* and *content validity* by using PCA and PFA techniques, respectively.

2.3. Multiple Regression Analysis of all the Variables.

In the original Aston study, a forward selection procedure was used in the multiple regression exercise to explain the effect on structural factors exercised by contextual variables. This meant that only the variable that would make the most significant addition would be added to those already in the equation.

This is not an entirely satisfactory procedure and could even be misleading as the significance of variables already in the regression alters as the exercise continues. For example, Clark (1990) found that the contextual variable of size was the most important single predictor of formalization. However, after including two more significant variables size became and remained insignificant.

Consequently, a "step-wise" regression procedure was preferred for this study. In other words, variables no longer making a significant contribution were removed from the regression at each step before any new and potentially significant variables were added. This involved both the forward selection and backward elimination procedures. The default criteria for the inclusion or elimination of variables into the regression equation were those recommended by both the SPSS/PC+ software as well as statistical experts from the University of South Africa. The regression procedure is discussed in more detail in chapter 8.

3. A FRAMEWORK FOR PORTRAYING ORGANIZATION VARIABLES.

The following pages provide the framework within which the analysis of the data gathered by the scales and measures used in the questionnaire took place. Firstly, the dependent variables will be examined and tables illustrating the reliability and multidimensionality of all the scales will be set out.

Thereafter, the independent or contextual variables will be examined. Again, reliability data will be displayed and discussed together with factor analyses, item analyses and intercorrelations for each scale.

3.1. Dependent Structural Variables: Reliability.

After the raw data gathered from the Questionnaire responses were loaded onto a computer data base, a number of statistical manipulations and operations were carried out. The results with respect to the dependent, structural variables are illustrated below, beginning with reliability values.

	SCALE	ALPHA or KUDER-RICHARDSON
1.	Functional Specialization	0,853
2.	Formalization	0,811
3.	Standardization	0,791
4.	Centralization	
	- autonomy/decentralization	0,865
	- decision making discretion	0,774
	- policy decision making	0,715
5.	Organicity	0,788

Figure 7.1. Reliability of Structural Scales.

Reliability data, i.e. the results of either the Kuder-Richardson or Coefficient Alpha analyses are displayed in figure 7.1. In his Canadian study, Clark (1990: 49) indicated that a reliability coefficient of 0,75 or higher was desirable; but for an exploratory study (such as this one) a level of 0,60 or higher would be acceptable.

Taken as a whole, then, the scales measuring the dependent variables showed an entirely acceptable level of reliability. Interestingly, the three scales exhibiting coefficients better than 0,80 were all Aston measures; reflecting, in what is probably its first South African application, the soundness and wide applicability of the Aston methodology.

3.2. Dependent Structural Variables : Multidimensionality and Validity.

The results of factor analyses carried out on each of the structural scales are displayed in Figures 7.2 through Figure 7.8. In evaluating whether or not the factor loadings are significant, the criteria proposed by Hair *et al* (1979 :234-235) were followed in this study. In brief :

- the larger the sample size the smaller the loading for it to be considered significant;
- the larger the number of variables the smaller the loading for it to be considered significant; and
- the larger the number of factors the larger the loadings on later factors need to be for them to be considered significant.

Hair *et al* (1979: 234) said that, in general, a loading of 0,30 is considered significant, a loading of 0,40 is considered more significant, and, finally, a loading of 0,50 is considered to be very significant. These estimates can shrink considerably as the sample size increases and Hair *et al* spoke of loadings of 0,15 being significant at the one percent level if the sample size exceeds 300.

The large sample size of this study enabled the use of stricter crite-

ria to evaluate the significance of loadings; and so only factor loadings in excess of 0,30 were considered to be significant. It was also felt that applying such rigorous norms would enhance the credibility of any comments that are made with respect to a scale's validity.

3.2.1. Functional Specialization.

Item	Factor 1	Factor 2	Factor 3
Public Relations	0.08581	**0.46418**	0.19070
Sales	**0.64049**	0.11511	0.05923
Transport	**0.34970**	0.15455	−0.00539
Employment	0.34378	0.23480	**0.57052**
Education & Training	0.09597	0.28665	**0.63625**
Welfare	0.19954	0.33328	**0.64297**
Purchasing	**0.67140**	0.10547	0.16584
Maintenance	**0.44525**	0.11860	0.20178
Accounts	**0.77957**	0.01445	0.06939
Production Control	**0.46322**	0.16469	0.25679
Inspection	**0.49105**	0.12420	0.29435
Methods	0.12778	**0.40911**	0.29190
Research/Development	0.14896	**0.45055**	0.23577
Records	0.22301	**0.45798**	0.12887
Legal/Secretarial	0.08474	**0.63837**	0.07219
Market Research	0.07350	**0.69684**	0.17626
M I S	**0.39056**	0.37297	0.25550
Rotated Factor Matrix:	Varimax converged in 6 iterations.		

Figure 7.2 Functional Specialization: principal factor analysis

The principal factor analysis for the first of the structural scales - that of Functional Specialization - is set out in figure 7.2. It will be seen that every variable, or item, has at least one significant loading and that three easily identifiable factors emerged.

These were labelled :

Factor 1 : *Core Activities* - throughput and direct support

Factor 2 : *Ancillary Activities* - boundary spanning and indirect support

Factor 3 : *Human Resources* - procurement, development and care of people.

An indication of the construct validity of the functional specialization scale can be gauged by looking at the size of the first factor that was extracted by the PCA method and the amount of variance that it explains. It is quite large and accounts for 30,3 % of the total variance - and, taken together, all three factors account for 48,5 % of variance.

On the whole, then, the Functional Specialization scale can be regarded as a reasonably valid measure of specialization. The three underlying critical areas of business activity that are illustrated in the principal factor analysis also point to an acceptable level of content validity. Alpha coefficients for the three factors extracted were calculated and these were as follows:

FACTOR			ALPHA COEFFICIENT
Factor 1:	*Core Activities*	-	0,7906
Factor 2:	*Ancillary Activities*	-	0,7352
Factor 3:	*Human Resources*	-	0,7585

3.2.2 Formalization

Turning now to the factor analysis of the Formalization data (figure 7.3), it is evident that all of the variables except one load significantly on at least one factor. Three factors were extracted by the PFA method:

Factor 1 : *Formalization of roles and relationships*

Factor 2 : *Formalization of procedures and policies*

Factor 3 : *Formalization of information and organization renewal.*

Item	Factor 1	Factor 2	Factor 3
Information booklets issued	0.19846	0.26080	**0.59253**
Number of Information Booklets	0.14779	0.12626	**0.71984**
Organization Charts	**0.35388**	0.28714	0.27495
Job Descriptions – directs	**0.37536**	0.28632	0.17216
Job Descriptions – line supervisors	**0.70518**	0.27260	0.08723
Job Descriptions – staff	**0.81478**	0.16645	0.11625
Job Descriptions – chief executive	**0.53064**	0.01868	0.14924
Operating Instructions	0.11824	**0.44845**	0.19108
Procedure Manuel	0.15474	**0.77815**	0.17363
Written Policies	0.28590	**0.60176**	0.21669
Production Schedule	0.05868	0.28517	0.25380
Research & Development programs	0.09473	0.21535	**0.33654**
Rotated Factor Matrix:	Varimax converged in 6 iterations.		

Figure 7.3 Formalization : principal factor analysis

Principal component analysis also extracted three factors, the first of which accounted for 33,2% of the variance. All three taken together accounted for 53,9% of variance. If a fourth factor whose eigenvalue was 0,992 (the default was set at 1,0) was included, then 62,2% of variance was accounted for.

The three logical and recognisable factors extracted through principal factor analysis indicate a high degree of content and face validity. The high percentage of variance explained in the principal component analysis lead to the conclusion that the construct validity of the scale is probably good.

The three areas of formalization described embrace, firstly, the human aspects of organizations. Secondly, they cover the task activities of organizations and, finally, they portray the survival and continuous renewal of organizations. Many aspects of Weber's ideal type together with Parsonian structural functionalism are illustrated in the three factors that are measured in this scale. This is not surprising since formalization of roles and procedures

lies at the nub of Weberian Bureaucracy. And in terms of the structural functional viewpoint, formalization presents an effective strategy to overcome the preservation and renewal challenges of adaptation, goal attainment, integration, and pattern maintenance.

The Alpha Coefficients for the three factors that were extracted were :

	FACTOR	ALPHA COEFFICIENT
Factor 1 :	*Formalization of roles and relationships*	0,7415
Factor 2 :	*Formalization of procedures and policies*	0,6925
Factor 3 :	*Formalization of information*	0,6102

3.2.3. Standardization.

The objectives of factor analysis are, firstly, to parsimoniously represent relationships among sets of variables and, secondly, to extract factors that are meaningful and interpretable. The standardization scale resulted in a single factor solution and all the

Item	Factor 1
Amount of routine	0.43793
People do the same job every day	0.60641
Variety of work	0.69654
Most jobs have something new	0.82355
Something different every day	0.73046
Unrotated Single Factor Matrix:	

Figure 7.4: Standardization : principal factor analysis

items loaded very significantly, as shown in figure 7.4. Principal component analysis indicated that the first, and only, factor accounted for 55,1% of the variance. So the assertion can be made that the scale measures what it is intended to measure and its

construct validity is good. The high factor loadings probably also reflect well on the content validity.

Despite these positive comments, the scale still seems a little simplistic. The Aston measures of standardization are no doubt far better, but they are very comprehensive and it was not possible to include them in this Questionnaire which was already quite bulky. It was noted that in the abbreviated Aston study (Inkson *et al* 1970: 318-329) the concept of standardization was dropped altogether from the structuring of activities variables. This made sense to them because formalization is, in any event, the other side of the same coin and is simply a measure of the degree to which standardization has been committed to writing.

Being a single factor solution there was, obviously, no need to recalculate Alpha Coefficients and the original coefficient as displayed on page 158 still applied.

3.2.4. Autonomy.

Principal factor analysis of the Autonomy or decentralization scale, shown in figure 7.5, yielded a five factor solution - which possibly conflicts with the objective of parsimony in factor analysis. Weighed against this, though, must be the large number of items that comprise the scale; so five factors is still acceptable. Clark (1990 : 50-51), in his analysis of Canadian textile firms, also produced a five factor solution for his decentralization scale.

Analysis of the factors indicated logical groupings which were labelled :

Factor 1:	*Decentralization :*	*Decisions affecting the management corps*
Factor 2:	*Decentralization :*	*Operating policies and responsibilities*
Factor 3:	*Decentralization :*	*Strategic marketing decisions*
Factor 4:	*Decentralization :*	*Operational expansion decisions*
Factor 5:	*Decentralization :*	*Extraordinary expenditure decisions*

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Management headcount	**0.51142**	0.04913	0.27312	0.14079	0.24334
Appoint managers	**0.70702**	0.11193	0.20626	0.16036	0.09526
Promote managers	**0.83018**	0.07720	0.14456	0.06305	0.08356
Managers' salaries	**0.64075**	0.06736	0.13404	0.02464	0.27906
Dismiss a manager	**0.57330**	0.08048	0.04654	0.12847	0.06392
New products/services	0.13245	0.19734	**0.64301**	0.06335	0.14534
Market territories covered	0.08776	0.00682	**0.61925**	0.03746	0.06962
Extent/type of markets	0.13139	0.01003	**0.77802**	0.02338	0.02725
Price of output	0.23786	0.21347	**0.51990**	0.16128	0.11565
Type/brand new equipment	**0.31958**	0.23535	0.05919	0.03155	0.24005
What will be costed	0.12561	0.29231	**0.33173**	0.15083	0.21295
What will be inspected	−0.13436	**0.50316**	0.13760	0.03263	0.12511
Operations to be workstudied	−0.01232	**0.55841**	0.08453	0.04501	0.00659
Suppliers of materials	0.11052	**0.40652**	−0.01123	−0.00563	0.08935
Buying procedures	0.20962	**0.53982**	0.13882	0.08955	0.19189
Training methods	0.22482	**0.42700**	0.02270	−0.05168	0.00847
What/extent welfare facilities	0.29700	0.21382	0.12008	0.12283	**0.30331**
Unbudgeted capital expense	0.24429	−0.00055	0.06068	0.08851	**0.64967**
Unbudgeted revenue expense	0.12342	0.14388	0.17682	0.05218	**0.46965**
Define responsibilities: specialists	0.13683	**0.56820**	0.18993	0.20423	0.04872
Define responsibilities: line depts.	0.05355	**0.53021**	−0.00854	0.09098	−0.02236
Create a new department	0.32302	0.17490	0.20377	**0.86030**	0.16698
Crearte a new job	0.45292	0.21115	0.13497	**0.46569**	0.16158
Rotated Factor Matrix:	Varimax converged in 5 iterations.				

Figure 7. 5 Autonomy or Decentralization : principal factor analysis

The only illogicality occurred in the first factor where the type and brand of new equipment was included in decisions affecting the management corps. Perhaps respondents had in mind that uniquely South African institution, the company car fleet, when they marked this item. Nevertheless, the difference between loadings on the five management corps variables and the new equipment variable is so great that the latter item can safely be ignored.

Every single variable loaded on at least one factor and a principal component analysis indicated that the five factors accounted for 53,7% of the total variance in the scale. The construct

validity, therefore, seems to be sound. As to content and face validity, there can be no argument with the explicitness of the five factors identified. Evaluating content validity always involves making a judgement (Brown, 1976: 125-128) and the judgement in this case was strongly in favour of the scale's content and face validity.

Alpha coefficients for each of the five factors were calculated and these are shown below :

	FACTOR	ALPHA COEFFICIENT
Factor 1:	*Decisions affecting the management corps*	0,8227
Factor 2:	*Operating policies and responsibilities*	0,7054
Factor 3:	*Strategic marketing decisions*	0,7523
Factor 4:	*Operational expansion decisions*	0,7839
Factor 5:	*Extraordinary expenditure decisions*	0,5611

This is obviously a very complex scale and the alpha coefficient for the fifth factor was a little disappointing. Nevertheless, the overall crispness and clarity of the scale in terms of its validity, reliability and underlying factors was a boon for further analysis. Centralization has been an area around which much controversy has taken place in the field of organization studies. Hopefully, the conclusions arrived at in South Africa by this study will be enhanced by the soundness of this scale.

3.2.5. Centralization of Policy Decisions.

The scale which measured centralization of policy decisions is shown in figure 7.6. It will be seen that the principal factor analysis yielded another single factor solution. The parallel principal component analysis indicated that the first, and only, factor accounted for 42,4% of the total variance. This was disappointing. So although it may be said that the scale's validity is adequate, its suitability for inclusion in further

Item	Factor 1
Major policy decisions	0.30068
Sales policy decisions	0.73713
Product mix decisions	0.71686
Production standards	0.56576
Manpower policies	0.55836
Selection of executive personnel	0.39802
Unrotated Single Factor Matrix:	

Figure 7.6. Centralization (policy decisions): principal factor analysis

analyses is, at best, limited. Generally speaking, the factors extracted from the decentralization/autonomy scale presented a more viable breakdown of decision-making, including policy decisions.

3.2.6. Centralization and Decision-making Discretion.

Centralization and decision-making discretion was a scale that was taken straight from the standard MBL/MBA text book by Robbins (1987: 486-493) who presented it as part of a group of three structural questionnaires. He asserted that his intention was to "...avoid the precision that the researcher would demand and settle for simple measures that will provide reasonable estimates of each dimension." In this statement Robbins probably undersells his centralization scale. Figure 7.7 reveals that the scale presents two very clear factors, both of which exhibit extremely high loadings on every single one of the variables. These factors are readily labelled :

Factor 1: *Centralization : Top management involvement*
Factor 2: *Centralization : First line supervisory discretion*

In a principal component analysis the first factor accounted for

38,8% of the total variance and both factors together took care of 59,2% of the variance.

Item	Factor 1	Factor 2
Top Management involvement :		
– gathering information	−0.05797	**0.71305**
– interpreting information	−0.03963	**0.73233**
– controlling decision execution	0.09158	**0.70962**
1st line supervisory discretion :		
– establishing budgets	**0.71626**	0.07915
– performance evaluation	**0.73125**	−0.02098
– hiring and firing	**0.60684**	−0.03247
– increases and promotions	**0.70593**	−0.01812
– buying equipment & supplies	**0.74667**	0.01032
– establishing new programs	**0.71507**	−0.04310
– hanling work exceptions	**0.61359**	0.01536
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.7 Centralization (decision making discretion) : principal factor analysis

Alpha coefficients for the two factors are indicated below :

	FACTOR	ALPHA COEFFICIENT
Factor 1:	*Centralization: Top management involvement*	0,7601
Factor 2:	*Centralization: First line supervisory discretion*	0,8644

All in all, the scale proved to be a robust measure with very strong construct, content and face validity. One which can be used with confidence in all further analyses.

3.2.7. Organicity or Operating Management Philosophy.

The last of the structural scales, that of organicity or operating management philosophy, is shown in figure 7.8. This scale also distilled two very strong factors on which all of the items loaded very significantly.

Item	Factor 1	Factor 2
Communication	0.11573	**0.65149**
Management style	0.22085	**0.67418**
Influence	0.21456	**0.35477**
Reaction to change	0.24145	**0.57035**
Procedures	**0.66303**	0.35170
Control	**0.78250**	0.14973
Task definition	**0.72013**	0.26553
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.8 Organicity (operating management philosophy) : principal factor analysis

The factors were labelled :

Factor 1: *Structural aspects* : *procedures, controls, and parameters*

Factor 2: *Behavioural aspects* : *management style, communication and response patterns.*

The strength and clarity of the factors indicated that the face and content validity were very good. The principal component analysis of the scale extracted two factors, the first of which accounted for 44,6% of variance and both factors together were responsible for 60,9% of the total variance in the scale. So the construct validity is also very good. The Alpha coefficients for the two factors came out as follows :

FACTOR			ALPHA COEFFICIENT
Factor 1:	*Structural aspects*	:	0,6807
Factor 2:	*Behavioural aspects*	:	0,8059

The organicity scale, then, also proved to be quite a sturdy measuring instrument which could be used with confidence in pursuing further analyses.

3.3. Factoring the Structural Variables and the Fourth Hypothesis.

The next step in the data treatment procedure was to establish the extent to which the structural variables of specialization, formalization, standardization, configuration, centralization, and organicity were independent of each other. In other words are they completely separate factors or do they have areas of commonality?

To answer this question the raw scores from the study were submitted to a correlational analysis (figure 7.9) as well as a factor analysis (figure 7.10). This methodology differed from the item analysis described in the previous sections of this chapter in that only a principal component analysis was used to extract underlying factors and not a principal factor analysis. This was deemed appropriate because the analysis was dealing with the agglomeration of all the structural scales. Principal component analysis, as a data reduction technique which also accounts for the maximum portion of the total variance represented by the diverse group of original scales, appeared more suitable.

Figure 7.9 illustrates the intercorrelations of all the structural

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Functional Specialization	1.00												
2. Formalization	**0.40**	1.00											
3. Standardization	**−0.17**	**−0.28**	1.00										
4. Autonomy	0.11	0.04	−0.10	1.00									
5. Policy decision making	**−0.21**	**−0.35**	**−0.21**	−0.09	1.00								
6. Decision making discretion	**−0.17**	**−0.27**	**0.26**	−0.07	**0.29**	1.00							
7. Organicity	−0.03	−0.05	**−0.21**	**0.23**	−0.03	**−0.28**	1.00						
8. Executive span	*0.12*	0.01	**−0.16**	0.07	−0.06	0.02	0.03	1.00					
9. Subordinate ratio	−0.02	**−0.17**	**0.21**	0.07	0.10	0.10	−0.04	0.04	1.00				
10. Organization depth	*0.15*	0.05	0.04	0.05	0.01	0.04	−0.07	0.07	0.01	1.00			
11. Management ratio	*0.12*	**0.24**	**−0.22**	0.01	*−0.13*	−0.06	−0.03	*0.15*	**−0.23**	0.06	1.00		
12. Support staff ratio	*0.13*	*−0.13*	0.06	0.00	0.11	0.07	0.04	−0.03	0.10	0.01	−0.06	1.00	
13. Clerical staff ratio	0.05	0.10	−0.08	0.14	−0.06	−0.07	−0.06	0.07	−0.07	−0.02	**0.33**	0.07	1.00

2−tailed significance : **Bold** = .001 *Italics* = .01

Figure 7.9 Intercorrelations of structural variables.

variables. It is immediately apparent that the most significant correlation is between Functional Specialization and Formalization.

This was not surprising and is consistent with findings throughout the world. The link between specialization and formalization is an intrinsic part of the Aston group's Structuring of Activities composite variable which arose out of the principal component analysis of their original data. Unusually, though, Standardization was negatively correlated with both the specialization and formalization measures. The three centralization scales exhibited the expected relationships with each other and with most other variables, bearing in mind that the autonomy scale is a measure of decentralization.

In terms of classical *Organization Theory*, the organicity variable displayed the expected relationships with the other structuring variables; namely, a strong positive correlation with decentralization and strong negative correlations with both centralization and standardization. The expected negative correlation with formalization was present, but it was very weak. Paradoxically, Organicity displayed no significant relationships with any of the configuration variables. The relationships were present - and all in the right directions - but all of them were far too weak to be considered significant.

3.3.1. <u>The Fourth Hypothesis</u>.

The fourth research hypothesis dealt specifically with the relationships between internal variables and, with the aid of figure 7.9, it was now possible to take a preliminary look at the postulated relationships.

$H_4(i)$ The first sub-hypothesis stated that vertical span, or organization depth, would be positively related to specialization, formalization, decentralization, lateral span of control and the administrative staff ratios. The correlation analysis indicated that :

- there is a weak positive relationship between Organization Depth and Functional Specialization;

- there is no significant relationship between Organization Depth and Formalization;

- in terms of all three measures of centralization or decentralization, there is no significant relationship between Organization Depth and decentralization;

- there is no significant relationship between Organization Depth and span of control, neither at the level of chief executive nor first line supervisor; and

- Organization Depth is not significantly related to administrative staff ratios, neither clerical staff nor indirect support staff.

H_4(ii) The second sub-hypothesis stated that formalization will be positively related to specialization, decentralization and the administrative staff ratios. Examination of figure 7.9 indicated that :

- the relationship between Functional Specialization and Formalization is quite strong and significant at the 0,001 level;

- although there is no relationship between Formalization and decentralization as depicted in the autonomy measure, there is still support for this sub-hypothesis in the fairly strong negative correlations between Formalization and the other two centralization scales: both of which are significant at the 0,001 level. In other words, the greater the degree of formalization, the more an organization is able to decentralize its decision making. So support is provided in a South

African context for Child's (1972: 163-177) proposition of *alternative strategies of control.*

- The administrative staff relationships with Formalization are inconclusive in that the indirect support staff ratio is negatively correlated and the clerical staff ratio is positively correlated. Both correlations are very weak.

In addition, there were fairly significant relationships at the 0,001 level between Formalization and :

- Standardization (negative),
- the first line Subordinate Ratio, and
- the Management Ratio.

None of these were postulated in the original fourth hypothesis but they are covered in more detail when the final sub-hypothesis is discussed.

H_4(iii) The third sub-hypothesis proposed that there would be a positive relationship between specialization, and decentralization and the administrative staff ratios. This was indeed so, with all three of the centralization/decentralization measures correlating with specialization, twice at the 0,001 level. The Support Staff ratio was weakly correlated at the 0,01 level but there was no significant relationship with the Clerical Staff ratio.

H_4(iv) The fourth sub-hypothesis said that decentralization will be positively related to the administrative staff ratios. There was limited support for this proposal in that autonomy (decentralization) showed a small relationship with the indirect Support Staff ratio. Conversely, Policy Decision Making (centralization) correlated positively, albeit weakly, with the Clerical Staff ratio.

$H_4(v)$ The final sub-hypothesis suggested that organizational shape or configuration would be related to specialization, decentralization and formalization. The configuration variables in figure 7.9 are numbered 8 to 13 and the following relationships are apparent :

- Functional Specialization is positively related to the chief executive's span of control, as well as to Organization Depth, the Management ratio, and the indirect Support Staff ratio. All of these relationships are significant at the 0,01 level.

- The relationships between the configuration variables and centralization are generally quite weak although they do follow the directions that were anticipated. The Subordinate ratio is positively correlated with the centralization of policy and discretionary decision making. Policy Decision making is negatively correlated with the Management ratio and positively correlated with the Support Staff ratio, both at the 0,01 level of significance. Finally, the Clerical Staff ratio is positively correlated with autonomy or decentralization.

  In summary, then, the more decisions are centralized, the less need for managers and the more the need for purely administrative staff.

- Formalization is positively related to the Management ratio, significant at the 0,001 level, and weakly related to the Clerical Staff ratio. But there is a negative relationship with the first line Subordinate ratio, also significant at the 0,001 level, and a negative relationship with the

indirect Support Staff ratio at the 0,01 level of significance.

In other words, the greater the degree of formalization, the more the number of managers and the fewer the number of subordinates and support staff. This is a puzzling conclusion and is quite the opposite of the accepted wisdom. Formalized systems and controls are usually surrogates for managers - allowing fewer managers to control more subordinates. Perhaps the answer to this apparent conundrum lies in the other unexpected negative correlation discussed earlier - that of Standardization and Formalization. Standardization measured the amount of routine in an organization and it now becomes apparent that, in this research application, standardization and formalization were not two sides of the same coin, as was apparently the case in other studies. Indeed, comparing the correlations with other variables where both standardization and formalization were simultaneously significant, the directions of the relationships in every case were the opposite of each other. So, in this study, standardization and formalization appear to have very different applications.

Turning back to the apparent conundrum, it becomes clear that it is standardization or routine, and not formalization, that is a surrogate for managers and that allows fewer managers to control more subordinates. The key to understanding the difference between formalization and standardization appears to lie in these two variables' relationship with centralization. So Child's *alternative strategies of control* thesis can be extended by

proposing a four-way relationship between centralization, formalization and standardization.

On the one hand :

- the more the formalization, the more the decentralization;
- the more the decentralization the more the need for managers as decentralized decision makers and the less the need for administrative staff.

And on the other hand :

- the more the centralization, the more the standardization or routine;
- the more the standardization or routine, the less the need for managers and the more the need for subordinate and administrative staff.

The question which now arises is, could the above pairs of relationships be a pointer to South African manufacturing organizations' structural uniqueness in terms of their mix of third world and first world components? The first pair of relationships is closer to the more classical and expected configuration and would undoubtedly apply to the first world component of the workforce.

In terms of the third world component, formalization could not work as an alternative control strategy simply because large parts of the labour force are illiterate. Management is often dealing with a labour intensive, unsophisticated workforce which is poorly educated and alienated from the dominant capitalist and first world business norms. In such

an environment, a high degree of routine and standardization would appear to be a more viable control strategy.

Looking at the fourth hypothesis overall, there seemed to be general support for the internal structural relationships that were proposed - with three possible exceptions :

(i) Of five anticipated correlations, Organization Depth showed a weak relationship to one variable and no significant relationship with the other four.

(ii) The relationship between formalization and the Subordinate ratios was also the opposite of what was anticipated.

(iii) Standardization was negatively correlated to both specialization and formalization, contrary to expectations and to the findings of other studies in advanced economies. The relationships between formalization, centralization and standardization or routine also exhibited characteristics which are dissimilar to those found in other studies.

3.3.2. Factor Analysis of the Structural Variables.

A factor analysis of all the dependent structural variables together yielded a five factor solution, with every variable loading significantly on at least one factor. Many of the loadings were quite high and the mean of all the significant loadings came out a at 0,6013. Each of the five factors was interpretable and the labels that were assigned to them together with the portion of variance accounted for by each factor were as follows :

		% of Var	Cum % Var
Factor 1:	*Alternative Strategies for Control*	18,6	18,6
Factor 2:	*Intrapreneurship*	11,0	29,6
Factor 3:	*Labour Intensity*	9,8	39,4
Factor 4:	*Leadership and Administration*	9,4	48,8
Factor 5:	*Shape*	7,7	56,6

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Functional Specialization	**0.67137**	−0.03027	0.07096	−0.02163	0.36222
2. Formalization	**0.77130**	−0.06423	−0.16507	0.11865	0.02432
3. Standardization	−0.26822	**−0.46379**	**0.44017**	−0.15961	−0.09689
4. Autonomy	0.12617	**0.55529**	0.28776	−0.01228	0.27907
5. Policy decision making	**−0.64696**	−0.13745	0.09152	−0.03306	0.07072
6. Decision making discretion	**−0.51134**	**−0.45173**	0.08812	−0.04034	0.29544
7. Organicity	−0.06913	**0.81032**	−0.04904	−0.07626	−0.10992
8. Executive span	−0.11800	0.22421	−0.18903	0.12647	**0.70845**
9. Subordinate ratio	−0.05620	0.00162	**0.72038**	−0.11571	0.13176
10. Organization depth	0.13670	−0.15994	0.17855	−0.03527	**0.56136**
11. Management ratio	0.15768	−0.02901	**−0.41239**	**0.62015**	0.22604
12. Support staff ratio	−0.22706	0.12751	**0.50903**	**0.45403**	−0.16753
13. Clerical staff ratio	0.08820	−0.04256	−0.00034	**0.81598**	−0.01005
Rotated Factor Matrix:	Varimax converged in 11 iterations.				

Figure 7.10. Structural variables : Principal component analysis.

Looking at each of the factors in turn, the following points emerged:

Factor 1: *Alternative Strategies for Control*: this factor was not the expected Structuring of Activities variable that often emerges as the first factor in similar analyses in Europe, America and other advanced economies. Nevertheless, the clear nexus between specialization and formalization on the one hand and decentralization on the other, make this factor strongly analogous to Child's (1972) Alternative Strategies of Bureaucratic Control.

Factor 2: *Intrapreneurship*: or *Entrepreneurship* if the organization is a principal unit and not part of a group. This factor is a combination of low routine, high autonomy and decentralized decision making, and very high organicity. It smacks of the kind of critical success factors necessary in a turbulent environment and at the beginning of an organization's life cycle.

Factor 3: *Labour Intensity* : the third factor is a combination of high routine, a larger number of subordinates, fewer managers, and lots of support staff. This factor does seem to be peculiar to this study and again seems to be associated with control strategies for the third world element of a manufacturing organization's workforce.

Factor 4: *Leadership and Administration* : this factor is concerned only with control and processing in terms of the numbers of managers and clerks in an organization.

Factor 5: *Shape* : the final factor is simply the depth and width of an organization's structure. These are the two elements that were missing from the first factor for it to have been the classical Weberian concept of Structuring of Activities.

The most notable difference between this study and other studies, particularly those of the Aston *genre* which were mainly conducted in Western economies, is the absence of the two composite variables of Structuring of Activities and Concentration of Authority as the major factors emerging from a principal component analysis of structural variables.

Again, the question needs to be asked, are we seeing something unique to South Africa in the factors that emerged from this analysis? For example, both the first and third factors appear to deal with strategies for exercising control. Varimax is an orthogonal rotation and this means that the factors are independent of each other and are not correlated at all. So the control strategies embodied in Factor 1 are very different from those in Factor 3 and their deployment would tend to be mutually exclusive. This appears to be another manifestation of the differing strategies employed to deal with the first world and third world elements of the labour force. High specialization

and formalization coupled with decentralization (factor 1) is aimed at the more sophisticated, better educated first world element, while control of the less literate third world component is achieved through high routine or standardization, proportionately fewer managers, more subordinates, and more indirect support staff.

The second factor, that of Intra/Entrepreneurship, also holds interesting connotations for South African manufacturing companies at this time. The current emphasis on economic growth, development and job creation are inextricably linked to the international competitiveness of local organizations. So the independent variables that bring about a spirit of entrepreneurship are of interest and will be pursued in the next chapter when multiple regression analysis is carried out.

This discussion concludes the first part of the analyses of the dependent variables. In the following sections the emphasis shifts from the structural variables to the concept of Organization Climate.

3.4. Dependent Organization Climate Variables : Reliability.

A similar procedure to that followed with respect to the structural scales was followed in dealing with the 9 Organization Climate scales. Reliability data displayed in figure 7.11 are all based on Cronbach's Coefficient Alpha. None of the Organization Climate scales are dichotomous and so the Kuder-Richardson Formula 20 was not used.

Apart from the measure for Emotional Control, all of the scales showed reliability coefficients that varied from good to very good. It will be remembered that the lower limit set earlier for acceptability of the structural scales was 0,60. Applying the same criterion to the Organization Climate scales seemed reasonable and consistent, and so their reliability was considered acceptable.

SCALE	COEFFICIENT ALPHA
1. **Authority**	
Leaders' psychological distance	0,75
Concern for employee development	0,80
Questioning authority	0,72
2. **Restraint**	
Emotional control	0,55
3. **Work Interest**	
Scientific and technical orientation	0,79
Intellectual orientation	0,81
4. **Personal Relations**	
Interpersonal aggression	0,80
5. **Routine**	
Rules orientation	0,70
Readiness to innovate	0,74

Figure 7.11 **Reliability of Organization Climate scales.**

3.5. <u>Dependent Organization Climate Variables : Multidimensionality</u>.

The results of factor analysis carried out on the organization climate scales are displayed in figures 7.12 through 7.19. Significant factor loadings are highlighted and discussed with each diagram. Although principle factor analysis and principal component analysis was carried out for each scale, this was mainly for the purpose of estimating validity. No attempt was made to formally label the factors extracted by each analysis; although in most cases the concepts associated with each factor were fairly obvious.

Each scale is in fact a subscale of the larger group of 72 items comprising the total Organization Climate measure. These items were

drawn from the Business Organization Climate Index (BOCI) devised by Payne and Pheysey (1971). The original BOCI consisted of 192 items which, in turn, were derived from 300 items on an Organization Climate Index formulated by Stern in the 1960s. So a considerably amount of refinement and distillation of the final scales had already taken place.

For the most part, each of the scales is quite strongly unidimensional, consisting of only two factors with a first factor that loads strongly and accounts for a large portion of the total variance of the scale. The scale for Employee Involvement was even more unidimensional and extracted only one factor.

3.5.1. Authority.

Item	Factor 1	Factor 2
Mode of address	0.03168	**0.79637**
Politeness imperative	**0.41571**	**0.43210**
Use of surnames	0.21724	0.24726
Expectation of respect	**0.37182**	0.33896
Looking for compliments	**0.50539**	0.21711
Jealous of authority	**0.75877**	0.17550
Bootlicking	**0.57698**	0.22746
Group of priveleged leaders	**0.58783**	0.05458
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.12 Leaders' psychological distance : principal factor analysis

The first of three scales that fall under the heading of Authority is that of ***Leaders' Psychological Distance.*** It yielded two factors, as can be seen in figure 7.12. The first was concerned with political manipulating and manoeuvring and the second focusing on the nature of interactions between levels of employees. The first factor loaded on six of the eight scale items and accounted for 37,1% of the variance. Both factors accounted for 50,8% of variance.

Alpha coefficients were calculated for both factors and these were, respectively, 0,75 and 0,58; indicating the strength of the first factor and the unidimensionality of the scale.

Item	Factor 1
Policy goals explained	**0.51380**
Criticism encouraged	**0.47473**
Caring enforcement of rules	**0.56390**
Access to senior personnel	**0.50190**
Concern for personal problems	**0.61372**
Tolerance of complaints	**0.73227**
Helpful senior personnel	**0.64013**
Listening senior personnel	**0.63356**
Unrotated single factor matrix	

Figure 7.13 Management concern for employee involvement : principal factor analysis

The second Authority scale, *Management Concern for Employee Involvement*, is shown in figure 7.13. Principal factor analysis yielded a single factor solution, which according to a principal component analysis, accounted for 42,7% of variance. The Alpha coefficient was 0,80; validity and unidimensionality were both apparently strong.

Item	Factor 1	Factor 2
Criticism of policies	**0.62475**	0.03352
Working to change policies	**0.55073**	0.26133
Non–acceptance of ineptitude	0.28411	**0.31420**
Proclaiming dissatisfaction	0.44486	**0.50019**
Avoidance of clashes	**0.48061**	0.19327
Opposition to management	0.15519	**0.38356**
Expectation of retaliation	**0.54144**	0.24665
Delight in challenging policies	0.05047	**0.57172**
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.14 Questioning authority : principal factor analysis

The last of the three Authority scales was *Questioning*

Authority. Although the items seemed to be quite homogeneous, figure 7.14 shows that two factors were still extracted. The first loaded on five of the eight items and accounted for 34,4% of variance. Both together accounted for 48,2% of variance. All in all, it was difficult to arrive at a conclusion with respect to the scale's validity. Revised Alpha coefficients were calculated as 0,71 and 0,55 for the two factors, respectively.

3.5.2. Restraint

Item	Factor 1	Factor 2
Expressing feelings	**0.63681**	−0.24934
Heated discussions	**0.40585**	0.39370
Felings not hidden	**0.60117**	−0.10338
Arousing excitement	**0.41729**	0.04844
Displays of emotion	**0.45415**	0.02246
No secret dislikes	0.05434	**0.41047**
Deeper feelings hidden	**0.52120**	0.12142
Mood swings	−0.19100	**0.60387**
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.15 Emotional Control : principal factor analysis

The only measure of Restraint, the scale for ***Emotional Control*** is shown in figure 7.15. Two factors are illustrated, the first dealing with the display of feelings or emotions, and the second addressing the lability or quantity of emotion. This scale did not come highly recommended from its United Kingdom application (Stewart *et al*, 1981) and its weakness was also apparent in this study. Alpha coefficients for the two factors were 0,66 and 0,41 respectively. The first factor accounted for 28,7% of variance and both together for 46,9%.

3.5.3. Work Interest

The ***Scientific and Technical Orientation*** scale (figure 7.16)

is one of two under the heading of Work Interest. A principal fac-

Item	Factor 1	Factor 2
Scientific method encouraged	**0.65821**	0.11297
Latest technical developments	**0.63994**	0.21283
Attending technical lectures	0.11817	**0.65569**
Background in science	0.17732	**0.74975**
Letest scientific inventions	**0.43475**	0.40505
Scientific/managment journals	**0.46439**	0.45670
Expertise	**0.41846**	0.07763
Research consciousness	**0.68176**	0.27472
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.16 Scientific and Technical orientation : principal factor analysis

tor analysis obtained two factors, both of which loaded quite strongly on all of the items. Broadly, the first factor focused on expertise and research and the second on technological developments. The first factor was quite large and accounted for 41,5% of the variance; both together took care of 56,5%. Recalculated Alpha's were 0,78 and 0,73 respectively for each factor.

Item	Factor 1	Factor 2
Tackling complex problems	0.37525	**0.45598**
Attending managment lectures	**0.56575**	0.06151
Intellectual stimulation	**0.81039**	0.18704
Deep thinking challenge	**0.83367**	0.22845
Well-read	**0.52674**	0.24653
Intellectual discussions	**0.50783**	0.41973
Acceptance of serious discussion	0.09719	**0.57979**
Reasoning and logic valued	0.12356	**0.61577**
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.17 Intellectual orientation : principal factor analysis

The second measure in the Work Interest grouping was the scale for *Intellectual Orientation*. Figure 7.17 illustrates the two

factors resulting from the principal factor analysis. The first appeared to be built around thinking, learning, and reading challenges; while the second was more concerned with discussion and logic. The first factor loaded strongly on six of the eight items and accounted for 43,3% of the scale's variance. Together with the second factor, 58,7% of variance was taken care of. The Alpha coefficients for the two factors were 0,82 and 0,66, respectively.

So it appeared that both of the scales in the Work Interest grouping showed up well in terms of their validity and reliability.

3.5.4. Personal Relations.

Item	Factor 1	Factor 2
Manipulating activities	**0.52046**	0.41845
Heated arguments	0.00854	0.20560
Apportionment of blame	0.24900	**0.37618**
Personal rivalries	**0.56380**	0.09304
Resentment	**0.67829**	0.40982
Little quarrels	**0.82452**	0.11059
Winning arguments	**0.76195**	0.16437
Brooding and moodiness	**0.70577**	0.28939
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.18 Interpersonal aggression : principal factor analysis

Interpersonal Aggression is the only scale in the category of Personal Relations. Principal factor analysis extracted two factors and the first loaded very strongly on all but two of the items (figure 7.18). Generally, the first factor seemed to be concerned with the active manifestations of aggression while the second looked more at passive manifestations of aggression. Principal component analysis indicated that 46,8% of variance was

accounted for by the first factor and 59,6% by both factors together. Alpha coefficients were 0,86 and 0,49 for the two factors. So the first factor seemed to be very strong and quite unidimensional, which reflected well on the scale's validity.

3.5.5. Routine.

Item	Factor 1	Factor 2
Violations reported	**0.59898**	0.11571
Attendance checked	**0.65450**	0.18087
What is done and not done	**0.59194**	0.13768
Attention to rules	0.33049	**0.50487**
Asking permission	0.36819	**0.40593**
Importance of rules	**0.54027**	0.23408
Display of rules	−0.04801	**0.31522**
Tolerance of deviation	**0.44352**	−0.07267
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.19 Rules orientation : principal factor analysis

Principal factor analysis of the ***Rules Orientation*** scale is shown in figure 7.19. On the first factor all but one of the items loaded significantly. The first factor dealt with the display of rules and the expectation of obedience. The second factor was more concerned with the actual compliance with rules. The first factor accounted for 35,0% of variance and both together for 49,3%. The recalculated Alpha coefficients were 0,74 and 0,34, respectively. So the validity seemed to be reasonable and the reliability acceptable.

The second measure under the heading of Routine was the scale intended to gauge ***Readiness to Innovate***. It is illustrated in figure 7.20. Again, it consisted of the customary two factors with the first loading on six of the eight items in the scale.

The first factor deals with generation of ideas, inventions and discoveries, while the second is more concerned with speed and flexibility.

Item	Factor 1	Factor 2
Rate of policy change	0.08227	**0.57478**
Speed of decisions and actions	0.22247	**0.79925**
Search for alternatives	**0.39807**	0.10426
New ideas	**0.54208**	0.31023
Latest scientific discoveries	**0.42355**	0.03348
Encouragement of plans	**0.68039**	0.11484
Conventionality	**0.54180**	0.25788
Programme flexibility	**0.46807**	0.40614
Rotated Factor Matrix:	Varimax converged in 3 iterations	

Figure 7.20 Readiness to innovate : principal factor analysis

The principal component analysis indicated that the first factor accounted for 36,9% and both for 51,7% of the total variance. The two highest factor loadings actually occurred in the second factor, hence the relatively low first factor variance. So the validity may also be less than satisfactory. The recalculated Alpha coefficients were 0,71 and 0,69, respectively.

In summary, the reliability and validity of the BOCI scales used in this study are illustrated in figure 7.21. Compared to their showing in the British applications (Stewart *et al*, 1981), most of the scales have maintained or improved their evaluative rating - with three possible exceptions :

- the validity of the Questioning Authority scale declined somewhat in the local application,
- the reliability of the Readiness to Innovate scale appeared to decline a good deal, and
- the validity of the Rules Orientation scale also seemed to be weaker in this study.

	Scale	Reliability	Validity
1.	**Authority**		
	Leaders' Psychological Distance	acceptable	acceptable
	Concern for Employee Involvement	good	good
	Questioning Authority	acceptable	uncertain
2.	**Restraint**		
	Emotional Control	adequate	adequate
3.	**Work Interest**		
	Scientific & Technical Orientation	good	good
	Intellectual Orientation	good	good
4.	**Personal Relations**		
	Interpersonal Aggression	good	good
5.	**Routine**		
	Readiness to Innovate	good	uncertain
	Rules Orientation	acceptable	adequate

Figure 7.21. **Reliability & validity of the Organization Climate Scales.**

It must, of course, be remembered that validity of the climate scales in the context of this study has to be a preliminary, subjective judgement. The scales would have to be used and analysed in a local context many more times before a final definitive statement could be made regarding their construct and content validity.

3.6. Factoring the Organization Climate Variables.

The next step in the process was to establish the extent to which the organization climate variables are independent of each other. In other words, are they completely separate factors or do they have areas of commonality?

To address this question, the raw scores from the study were submitted to a correlation analysis (figure 7.22) as well as a factor

analysis (figure 7.23). A similar procedure was followed to that which was carried out with the structural variables. That is, a principal component analysis endeavoured to trace the extent to which separate dimensions were involved as well as reducing the amount of data resulting from the agglomeration of all the organization climate scales.

3.6.1 Intercorrelation Matrix.

The intercorrelation matrix for all the organization climate variables is depicted in figure 7.22. No specific hypotheses were

Variable	1	2	3	4	5	6	7	8	9
1. Leaders' psychological distance	1.00								
2. Concern for employee involvement	**−0.54**	1.00							
3. Questioning authority	**−0.29**	**0.41**	1.00						
4. Emotional control	**0.21**	**−0.21**	**−0.39**	1.00					
5. Scientific & Technical orientation	−0.09	**0.25**	**0.25**	**−0.19**	1.00				
6. Intellectual orientation	*−0.15*	**0.34**	**0.29**	**−0.28**	**0.68**	1.00			
7. Interpersonal aggression	**0.54**	**−0.58**	**−0.20**	0.07	**−0.16**	**−0.23**	1.00		
8. Rules orientation	**0.16**	0.11	−0.12	0.10	0.04	0.08	−0.08	1.00	
9. Readiness to innovate	**−0.35**	**0.50**	**0.36**	**−0.28**	**0.40**	**0.36**	**−0.38**	−0.05	1.00

2 − tailed significance : Bold = .001 Italics = .01

Figure 7.22 Intercorrelations of climate variables

put forward with respect to the interrelationships between the nine organization climate variables. The matrix is, therefore, tabulated here with just the following two general comments :

§ Organizations which have leaders who are perceived to be psychologically distant also have a high level of interpersonal aggression, lack of emotional control and lack of employee involvement. Leadership that is perceived to be distant does not square with an organization climate in which limits are challenged, questions are asked, and innovation thrives.

§ Conversely, an organization which is perceived as being concern-

ed about employee involvement shows little sign of emotional volatility and interpersonal aggression. It is marked by a questioning, intellectual, scientific bias and is quick to innovate.

The interrelationships that are summarised in these two general comments are interesting mainly because they are empirically based facts and not *a priori* theorizing or the "...idealistic futures and exotic answers..." referred to by Human (1993: 205) and quoted on page 1 of this report.

The concept of Organization Effectiveness and its evaluation and measurement was deliberately avoided in the course of formulating the research problem for this study. It was felt that the concept was too big and too complex to include and would muddy the waters if it was embodied as part of this project. Nevertheless, it is still possible to make some sort of preliminary assessment of organization effectiveness by establishing the extent to which an organization's climate is either facilitating and functional or obstructive and dysfunctional. So the associations between contextual and structural variables, and their effects on organization climate, that will be pursued in the next chapter hold significance from an organizational effectiveness point of view as well.

3.6.2 Factor Analysis of the Organization Climate Variables

The principal component analysis of all of the organization climate measures together presented a three factor solution. All of the variables loaded significantly. The three factors were labelled as follows :

		% of Var	Cum % Var
Factor 1:	*Supportive Organization Values*	36,5	36,5
Factor 2:	*Cerebral Stimulation*	15,7	52,2
Factor 3:	*Acceptance of Rules and Restraints*	13,7	65,9

The elements which comprise the three factors are illustrated in figure 7.23. They are very self explanatory and will, therefore, not be examined any further here.

Item	Factor 1	Factor 2	Factor 3
1. Scientific & Technical orientation	0.06081	**0.86753**	−0.03859
2. Intellectual orientation	0.15133	**0.85915**	−0.04808
3. Leaders' psychological distance	**−0.79710**	0.06580	0.26981
4. Concern for employee involvement	**0.81200**	0.27615	−0.03737
5. Readiness to innovate	**0.51993**	0.44761	−0.24509
6. Interpersonal aggression	**−0.84546**	−0.08230	−0.12415
7. Emotional control	−0.09895	−0.34304	**0.62943**
8. Rules orientation	0.07748	0.25661	**0.75250**
9. Questioning authority	0.33351	0.33558	**−0.55613**
Rotated Factor Matrix:	Varimax converged in 4 iterations.		

Figure 7.23 Organization Climate : principal component analysis

In a British application of the BOCI, Payne and Pheysey (1971b) extracted two meaningful factors which they labelled Organization Progressiveness and Normative Control. Their two factors are loosely analogous to the first and third factors identified in this study, except that the Scientific and Technical Orientation variable and the Intellectual Orientation variable were both included in their first factor. It was interesting to find in the local application, therefore, that both of these variables came out as a very strong and independent second factor which was labelled Cerebral Stimulation.

There was also some difference in the amount of variance accounted for by the factors extracted in the British study, viz:

		% of Var	Cum % Var
Factor 1:	*Organization Progressiveness*	36,3	36,3
Factor 2:	*Normative Control*	9,3	45,9
Factor 3:	*(Unidentifiable & Insignificant)*	5,7	51,6

It seems, then, that the application of a shortened form BOCI in this

study has stood up quite well and, in some respects, has performed better in terms of validity and reliability in South African conditions.

4. INDEPENDENT VARIABLES : THE CONTEXTUAL SCALES.

A similar procedure to that followed with respect to structural and organization climate scales was followed in dealing with the 6 contextual scales, bearing in mind that some of them, such as size and age, were point measures and did not require any further analysis.

4.1. Reliability.

Reliability data in the form of Coefficient Alpha is displayed in figure 7.24.

	SCALE	ALPHA COEFFICIENT
1.	Size	Point measure
2.	Age	Point measure
3.	Dependence	
	- internal	0,63
	- external	0,09
4.	Technology	
	- workflow integration	0,66
	- process technology	0,89
5.	Power control	0,59*
6.	Environment	
	- change & predictability	0,64**
	- operating environment	0,43

Figure 7.24. Reliability of the contextual scales.

* grows to 0,66 if 2 items containing double negatives are omitted.

** two similar scales combined.

A couple of problem areas are apparent; firstly, in the scale of external dependence, and then in the measure of the operating environment. It will be recalled that the wording of the operating environment scale was problematic because of the recent momentous political changes. It does seem possible that, as was feared, many respondents did allow their perceptions of the recent political environment to colour their perceptions of the operating environment within which their organizations have historically functioned. This is probably not a reflection on the value of the scale *per se* and subsequent analyses which used this scale took cognisance of this fact.

Insofar as the external dependence scale was concerned, it would appear that the two dimensions which comprise the scale did not combine well in a South African situation. Several measures of reliability were tried but none could improve on the very poor Alpha coefficient. The two dimensions of the scale were, therefore, split and treated as separate variables for all subsequent analyses, thereby turning them into a form of point measurement. In his Canadian study, Clark also had a problem with this scale which, in that instance, achieved a reliability coefficient of only 0,28.

4.2. Multidimensionality.

Where appropriate, item correlations and factor analyses were carried out on the contextual scales and are displayed in Figures 7.25 through Figure 7.32. Significant correlations and factor loadings are highlighted and discussed with each diagram.

4.2.1. Dependence.

The correlation matrix for all of the dependence measures together is shown as figure 7.25. It will be seen that all of the most significant correlations occur along the dimensions of public accountability and size relative to owning group.

Variable	1	2	3	4	5	6
1. Origin	1.000					
2. Status of establishment	*0.138*	1.000				
3. Public Accountability	**0.374**	**0.193**	1.000			
4. Relative size	**0.293**	**0.364**	**0.542**	1.000		
5. Dependence on supplier	0.073	0.103	−0.031	0.082	1.000	
6. Dependence on customer	0.026	0.014	0.044	0.108	0.047	1.000

2 – tailed significance : **Bold = .001** *Italics = .01*

Figure 7.25 Dependence : Item correlations

It would seem, therefore, that the most significant relationships insofar as dependence is concerned are internal and connected to ownership and accountability. The two external dependence variables showed no significant correlations, either to themselves or to the other dependence measures.

Item	Factor 1	Factor 2
1. Origin	**0.63341**	−0.00932
2. Status of establishment	**0.48479**	0.34716
3. Public Accountability	**0.82325**	−0.12349
4. Relative size	**0.80502**	0.17211
5. Dependence on supplier	−0.02889	**0.83551**
6. Dependence on customer	0.05013	**0.48400**
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.26 Dependence : principal component analysis

Turning to the factor analysis of this scale, a principal component analysis (figure 7.26) provided results that allowed for a different interpretation. Two distinct factors were thrown up : the first to do with ownership and accountability and the second, quite clearly, to do with external dependence. So external dependence does present an independent dimension which has possible significance for causality. The percentage of variance explained by each of the factors is as follows :

		% of Var	Cum % Var
Factor 1:	*Ownership and Accountability*	33,5	33,5
Factor 2:	*External Dependence*	17,6	51,1

4.2.2. Technology.

For the purpose of item analysis, both of the Technology scales of Workflow Integration and Process Technology were combined into a single matrix. The correlation matrix is shown as figure 7.27.

Variable	1	2	3	4	5	6	7
1. Mode	1.000						
2. Range	**0.501**	1.000					
3. Custom	**−0.168**	−0.080	1.000				
4. Small batch	**−0.180**	−0.080	**0.449**	1.000			
5. Large batch	−0.044	−0.048	−0.001	0.053	1.000		
6. Mass production	−0.025	0.111	−0.106	−0.074	**0.233**	1.000	
7. Continuous process	**0.365**	**0.234**	**−0.164**	**−0.363**	**−0.158**	0.006	1.000

2 − tailed significance : **Bold = .001**

Figure 7.27 Technology : Item correlations

Apart from the first two items which comprise the Workflow Integration scale and are, therefore, strongly correlated with each other, most of the other correlations were negative. This is to be expected as most organizations would be married to a single dominant technology and the choices open to them are largely mutually exclusive. Interestingly, though, there was a significant correlation between Custom and Small Batch technologies, throwing up the possibility of a "customized small batches" category of process technology. It was also noted that the Workflow Integration variables are correlated with the most automated level of the Process Technology scale. This is logical since the Workflow Integration actually measures the degree of automaticity.

The factor analysis for the Technology scales is shown in figure 7.28. Three factors were extracted and their Alpha coefficients and explanation of variance are set out below :

		Alpha	% of Var	Cum % Var
Factor 1:	*Automaticity*	0,52	29,6	29,6
Factor 2:	*Customized / small batch*	0,62	18,5	48,1
Factor 3:	*Large batch / mass*	0,38	17,2	65,3

Item	Factor 1	Factor 2	Factor 3
1. Mode	**0.83117**	−0.13621	−0.04786
2. Range	**0.84942**	0.04563	0.11305
3. Custom	−0.02284	**0.78986**	−0.12702
4. Small batch	−0.08937	**0.85188**	0.02561
5. Large batch	−0.08256	0.08722	**0.77048**
6. Mass production	0.08085	−0.14260	**0.76790**
7. Continuous process	**0.50101**	−0.46157	−0.23787
Rotated Factor Matrix:	Varimax converged in 5 iterations.		

Figure 7.28 Technology : principal component analysis

All of the items load very significantly and the logic of the three factors follows that of the original measures closely, i.e. a measure of automaticity combined with an evaluation of increasing levels of continuity of throughput or automation. Separating out the factors has a considerably deleterious effect on reliability and so it is doubtful whether any worthwhile purpose would be served by pursuing any of the factors separately.

4.2.3 Power Control

The Power Control scale was improved by dropping two items which had apparently been clumsily worded and had caused some confusion.

Variable	1	2	3	4	5	6	7
1. Structure independent of strategy	1.000						
2. Power enhancing structural choices	**0.319**	1.000					
3. Self−serving ideas	**0.178**	**0.431**	1.000				
4. Dominant coalition	0.009	0.099	*0.132*	1.000			
5. Structure independent of size	**0.242**	0.115	0.087	0.039	1.000		
6. Struct. independent of technology	**0.352**	**0.182**	0.087	−0.024	**0.361**	1.000	
7. Struct. independent of environment	**0.550**	**0.266**	*0.136*	−0.015	**0.318**	**0.617**	1.000
2 − tailed significance :	**Bold = .001**			*Italics = .01*			

Figure 7.29 Power Control : Item correlations

This improved the reliability coefficient to the extent indicated earlier in figure 7.24. The correlation matrix is shown above in

figure 7.29. The most significant correlations indicated that organization structure is simultaneously independent of strategy, size, technology, and environment. At the same time, self serving ideas and power enhancing structural choices are positively related to each other. So there does not seem to be any linkage between structure and any of traditional structural imperatives of strategy, size, technology or environment.

A first reading of these interrelationships certainly seems to indicate that there may well be some support for the power control viewpoint. In other words, organization structure is nothing more than the result of the dominant coalition seeking those controls and designs that will enhance their power.

The factor analysis extracted two fairly clear dimensions of this scale. These were labelled Structural Independence and Political Manipulation respectively. Examination of figure 7.30 indicates that the component dimensions are quite self explanatory and do not need further elucidation.

Item	Factor 1	Factor 2
1. Structure independent of strategy	**0.68842**	0.23914
2. Power enhancing structural choices	0.29052	**0.73894**
3. Self–serving ideas	0.10021	**0.80103**
4. Dominant coalition	–0.12352	**0.47973**
5. Structure independent of size	**0.58867**	–0.01688
6. Struct. independent of technology	**0.80949**	–0.04453
7. Struct. independent of environment	**0.85476**	0.07725
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.30 Power Control : principal component analysis

Alpha coefficients and percentages of variance accounted for are detailed below :

		Alpha	% of Var	Cum % Var
Factor 1:	*Structural Independence*	0,73	35,6	35,6
Factor 2:	*Political Manipulation*	0,45	18,7	54,3

In summary, it appeared that once the Power Control scale had been modified to remove the two doubtful items it performed quite well as an independent variable in this study.

4.2.4. Environment

For item analysis purposes, it was decided that the scales for environmental change and environmental predictability were conceptually close enough to combine into a single measure of environmental uncertainty. Figure 7.31 illustrates the resultant correlation matrix. The first six items comprised the change scale and the next eight were from the predictability scale.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Job changes over 5 years	1.00													
2. Socio–economic & political	**0.22**	1.00												
3. Community & professional	*0.15*	**0.41**	1.00											
4. Work methods & requirements	0.11	0.05	0.06	1.00										
5. New techniques & methods	**0.21**	**0.27**	**0.24**	−0.04	1.00									
6. New types of problems	**0.28**	**0.21**	**0.16**	**0.17**	**0.41**	1.00								
7. Operations technology	0.05	−0.02	−0.02	0.03	0.10	*0.14*	1.00							
8. Competitors' actions	0.08	0.01	−0.05	0.08	−0.03	*0.12*	**0.20**	1.00						
9. Market demand	0.04	0.03	−0.02	0.01	−0.03	0.07	0.08	**0.24**	1.00					
10. Product attributes/design	0.00	−0.02	0.04	0.09	0.06	*0.12*	**0.27**	*0.14*	**0.20**	1.00				
11. Raw material availability	−0.04	−0.04	−0.02	0.00	−0.02	0.01	**0.17**	**0.17**	*0.13*	**0.25**	1.00			
12. Government regulations	0.07	0.05	0.03	0.04	0.02	0.07	0.09	0.08	*0.13*	**0.16**	**0.25**	1.00		
13. Labour union actions	0.11	0.02	−0.01	0.04	0.05	0.05	**0.16**	**0.19**	**0.18**	0.09	*0.15*	**0.29**	1.00	
14. Raw material price	−0.03	0.06	0.01	0.06	0.07	0.02	*0.14*	*0.15*	0.12	**0.22**	**0.42**	**0.26**	**0.23**	1.00

2–tailed significance : **Bold** = .001 *Italics* = .01

Figure 7.31 Environment : Item correlations.

It will be seen that the significant correlations mirror these two composite dimensions of the total scale. The top half of the matrix highlights relationships between socio-political and community variables, as well as between work methods and new techniques and problems. The bottom half looks at associations involving government regulations, trade union activities, and, finally, material availability and prices. These relationships were crystalized further in the factor analysis.

Principal component analysis yielded five factors, two of which showed no clear rationale or ease of analysis. A principal factor analysis was then carried out and again five factors were generated, as shown in figure 7.32. This time, however, all five of the factors lent themselves to analysis and examination. A five factor solution is, obviously, not congruent with the objective of parsimony in the analysis. Nevertheless, the environment is, by definition, diverse and complex and it would be inherently difficult to devise a simple, unidimensional measure. A homogeneous environmental measure is, perhaps, a contradiction in terms. For this reason it was probably better that principal factor analysis was used as a data description technique rather than the principal component data reduction technique.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Job changes over 5 years	−0.12724	0.29271	0.22729	0.18279	0.15387
2. Socio−economic & political	−0.01149	0.16001	**0.68891**	0.04491	0.04325
3. Community & professional	0.02167	0.14936	**0.55257**	−0.00933	−0.03398
4. Work methods & requirements	−0.00208	0.05554	0.07697	0.21822	0.00856
5. New techniques & methods	0.08241	**0.66910**	0.23666	−0.12435	0.01876
6. New types of problems	0.00159	**0.59827**	0.15858	0.26127	0.00264
7. Operations technology	0.25463	0.19126	−0.10675	0.25911	0.04200
8. Competitors' actions	0.13660	0.01894	−0.05379	**0.45693**	0.14102
9. Market demand	0.14170	−0.02590	−0.00486	**0.34848**	0.15334
10. Product attributes/design	**0.41919**	0.10843	−0.03604	0.30996	−0.04998
11. Raw material availability	**0.61463**	−0.05834	−0.02916	0.09460	0.12259
12. Government regulations	0.30085	0.01649	0.05893	0.09191	**0.36346**
13. Labour union actions	0.14039	0.05713	−0.02762	0.18039	**0.60878**
14. Raw material price	**0.58462**	−0.00447	0.06279	0.04142	0.23684
Rotated Factor Matrix:	Varimax converged in 8 iterations.				

Figure 7.32 Environment : principal factor analysis

The five factors that emerged were all reasonably easily labelled and the recalculated alpha coefficients together with the table of variance percentages interpreted by each of the factors is set out below. The division between the two aspects of the combined scale is again apparent in the factor analysis. The second and third factors are loosely analogous to the first six items or the change

scale, while the next eight appear to reflect the remaining items, or the predictability scale.

		Alpha	% of Var	Cum % Var
Factor 1:	*Material: price & availability*	0,56	17,4	17,4
Factor 2:	*Technological demands*	0,58	14,1	31,5
Factor 3:	*Community & Socio-economic*	0,58	8,5	40,0
Factor 4:	*Strategic Marketing demands*	0,39	7,8	47,8
Factor 5:	*Politico-legal pressures*	0,45	7,3	55,1

Bearing in mind that later factors should load heavier to be significant and coupled with the small percentage of variance explained by the last two factors, it becomes apparent that the first three environmental factors are the most prominent. The most important factors are procurement of materials and technological challenges, which is probably in keeping with South Africa's status as a developing country. Significantly, strategic market demands come a distant fourth, barely making it into the reckoning of critical influences.

4.2.5 Operating Environment

The final contextual measure was the debatable Operating Environment scale. It consisted of only four dimensions and these are exhibited in figure 7.33. It will be seen that the first three items are reasonably clearly related to each other and the fourth is not related at all to any of the others.

Variable	1	2	3	4
1. Familiarity of events	1.000			
2. Rapidity of change	**0.208**	1.000		
3. Visibility of the future	**0.436**	**0.234**	1.000	
4. Complexity	0.051	−0.014	0.032	1.000

2−tailed significance : **Bold = .001**

Figure 7.33 Operating Environment : Item correlations.

The factor analysis revealed a two factor solution (figure 7.34) with all of the items loading very highly. Although Anshoff and Sullivan (1993) used the term complexity to describe the last item on the scale, it is possibly a misnomer. All of the options on this item in fact concerned only the geographical scope of the organization's business operations.

Item	Factor 1	Factor 2
1. Familiarity of events	**0.77862**	0.12357
2. Rapidity of change	**0.59767**	−0.18862
3. Visibility of the future	**0.79627**	0.06936
4. Complexity	0.01183	**0.97730**
Rotated Factor Matrix:	Varimax converged in 3 iterations.	

Figure 7.34 Operating Environment : principal component analysis

So the two factors can be labelled (i) operating environmental turbulence, and (ii) scope of operating environment. The recalculated alpha coefficient for the first factor came out at 0,54. It was not possible to provide a revised alpha coefficient for the second factor because it consisted of only one item. The percentages of variances explained by the two factors were :

		% of Var	Cum % Var
Factor 1:	*Turbulence*	40,0	40,0
Factor 2:	*Scope*	25,2	65,2

So, in terms of homogeneity, this scale was fairly unidimensional, despite being a measure of environment. Insofar as it confined itself to only certain aspects of the operating environment, its performance seemed to be quite satisfactory.

4.3. Framework for Analysis : concluding remarks

The above section concludes the framework for analysing the organizational and contextual variables. The contextual variables

were quite obviously discrete and independent of each other. So there was no requirement to perform either a correlational analysis or a factor analysis on all the variables combined as a whole.

With the generation of the above 34 summary diagrams the position was reached where the relationships between contextual and organizational variables could be thoroughly explored. The next chapter describes how this was done.

5. SUMMARY.

In this chapter each of the scales and measures that comprised the Questionnaire measuring instrument were subjected to detailed item analyses to establish their strength and suitability for inclusion in further analyses to explore causal relationships. In order to accomplish this item analysis the data gathered by each scale were subject to statistical procedures in order to establish the scales' reliability, multidimensionality, and, finally, their construct and content validity.

In summary, it may be said that the dependent variable scales of structure and organization climate, as well as the independent contextual variable scales, all performed sufficiently well to justify their inclusion in further analyses. Although there were one or two areas of concern in both the dependent and independent scales. These were highlighted in the course of the item analyses but none were considered serious enough to render any of the scales so deficient that it had to be precluded from the causal analysis.

Having established the strengths and weaknesses of the measures used it became possible to use these as building blocks to explore the causal relationships that possibly existed between the independent contextual variables and the dependent structural and organization climate variables. This exploration forms the subject of the next chapter.

CHAPTER EIGHT : STATISTICAL ASSOCIATIONS AND CAUSAL RELATIONSHIPS.

1. INTRODUCTION.

In this chapter the statistical associations and possible causal relationships that became evident in the course of this study will be pursued. The point has been made in many similar studies throughout the world that *causality* has not been proven. Aldrich (1972), in particular, challenged the claims to causality put forward by the Aston group. Using path analysis techniques Aldrich suggested that the direction of some of the relationships identified by the Aston researchers could in fact be the opposite to what they had postulated.

For the purpose of this study and the discussions of statistical associations the term causal will still sometimes be used for the sake of convenience. However, it is accepted that the most that can be said of the independent variables is that they *predict* elements of structure and climate, and that they do not necessarily cause them.

The chapter will begin by outlining again the independent and dependent variables. This will include a brief discussion of the Multiple Linear Regression statistical model and some problems encountered because of the diversity and large size of the total sample. The structure of organizations in the manufacturing industry will then be examined from a global point of view and some conclusions will be drawn with respect to the main associations arising from the multiple regression analysis.

The level of analysis will then move into a more focused perspective as the sample is stratified according to the various Standard Industrial Classification (SIC) codes which comprise the manufacturing sector. Significant relationships within - and differences between - industries will be highlighted and discussed.

Finally, the analysis will shift to Organization Climate and both the contextual variables and the structural variables will be treated as independent variables for the purpose of extracting noteworthy relationships.

In the next chapter, the research problem will be revisited and the hypotheses will be re-examined with a view to establishing the degree to which they have been supported in this South African study.

2. PREDICTING STRUCTURE AND ORGANIZATION CLIMATE.

Figure 8.1. summarises all of the independent contextual variables as well as the internal dependent variables. The procedure was to treat

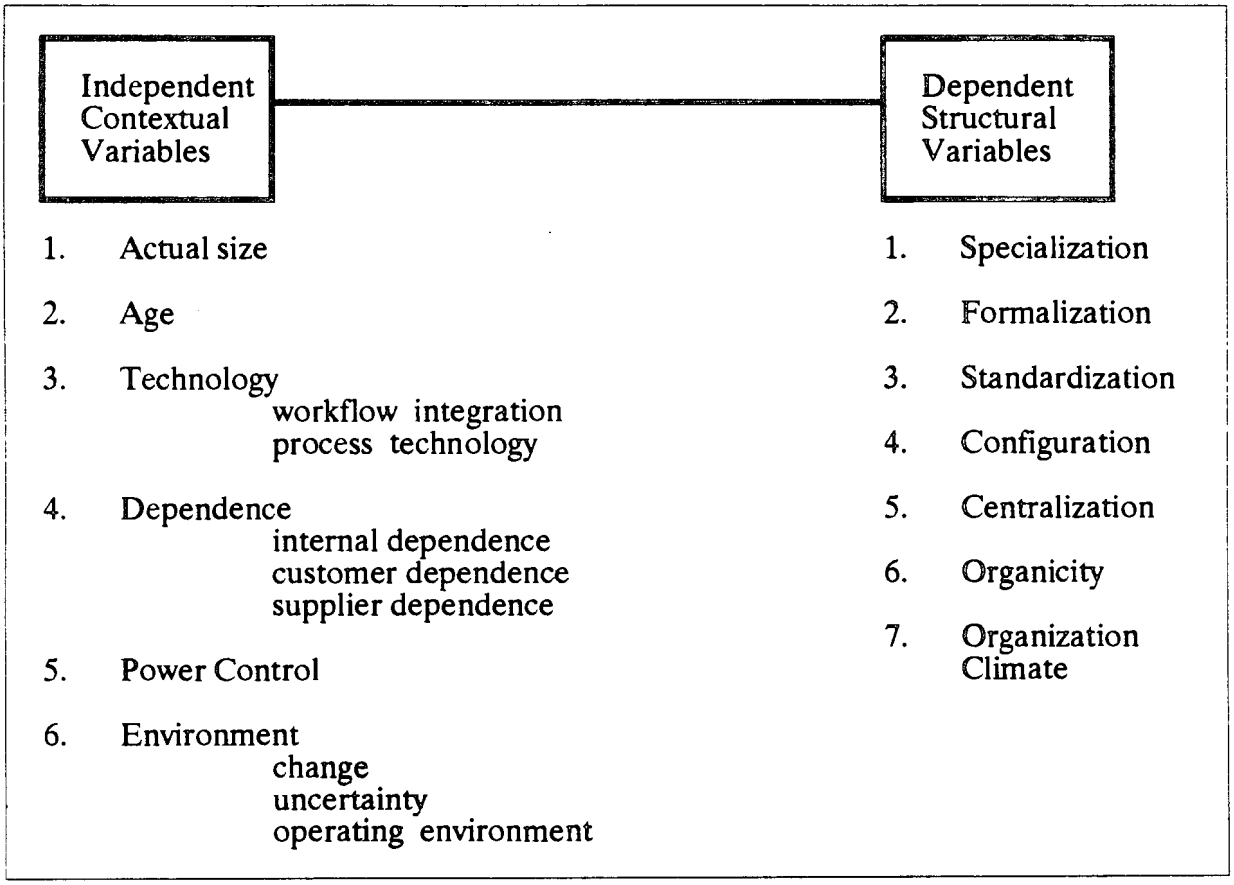

Figure 8.1. Independent and Dependent Variables.

each of the six structural variables and eight organization climate variables as dependent variables and to ascertain how much of the statistical variance in each dependent variable could be predicted by the independent contextual variables. The exercise was repeated with the organization climate variables and then expanded in that each of the in-

ternal structural variables was also treated as an independent variable for the purpose of predicting and analysing organization climate. The search for statistically meaningful relationships was carried out by means of multiple linear regression.

2.1. Multiple Linear Regression.

The multiple linear regression procedure can be extremely complex and elaborate, particularly if the analysis includes a detailed examination of the residuals from every regression equation. This is often done in order to establish that the basic assumptions of multiple regression analysis have not been violated.

Such a detailed scrutiny of residuals was at odds with the objectives of this study, which were to keep the statistical procedures as simple as possible. The point was made earlier that this study is about Organization Theory, and not about statistical procedures used in organization studies.

Nevertheless, it was felt that a basic analysis of residuals was desirable and so it was carried out for each of the structural regression equations. The residual analyses consisted of :

(i) ***the Durbin-Watson statistic*** - to test for sequential independence of observations,

(ii) ***standardized outliers*** - extracting the ten cases with the largest absolute values after residual scores have been standardized,

(iii) ***histogram of standardized residuals*** - which plots the observed residuals against an expected normal distribution and highlights skewness and non-normality in the residual display, and

(iv) *normal probability plot of standardized residuals* - which also checks for normality by plotting the cumulative probability of observed residuals on the expected residuals (i.e. a straight line).

In one or two instances a transformation of the data, e.g. by taking the natural log of the dependent variable, did achieve a better solution.

2.1.1. Sample Size and Linear Relationships

A large sample size is normally considered advantageous to statistical analysis because it enhances the credibility of the statistics drawn from the sample and increases their generalizability to the population from which they are drawn.

An apparent problem encountered early in this study was the generally low levels of both correlation (R) and the concomitant amount of variance explained in the multiple regression analysis (R^2). Although these statistics were not really low in absolute terms, they were certainly a fair amount lower than those encountered in similar studies carried out overseas.

However, the sample sizes of most of these overseas studies were considerably smaller than the sample size of this study and this fact pointed to the most likely explanation for the smaller South African correlations.

The strongest predictive relationship between two variables yielding a perfect correlation (R = 1,0) would be shown graphically as a straight line. In practice, a batch of observations which exhibits a strong linear relationship between variables comes out as an elliptical cluster when displayed on a graph, as in figure 8.2. The more the distribution resembles a circle, the closer the

correlation approaches zero, indicating no linear relationship between the variables (R = 0).

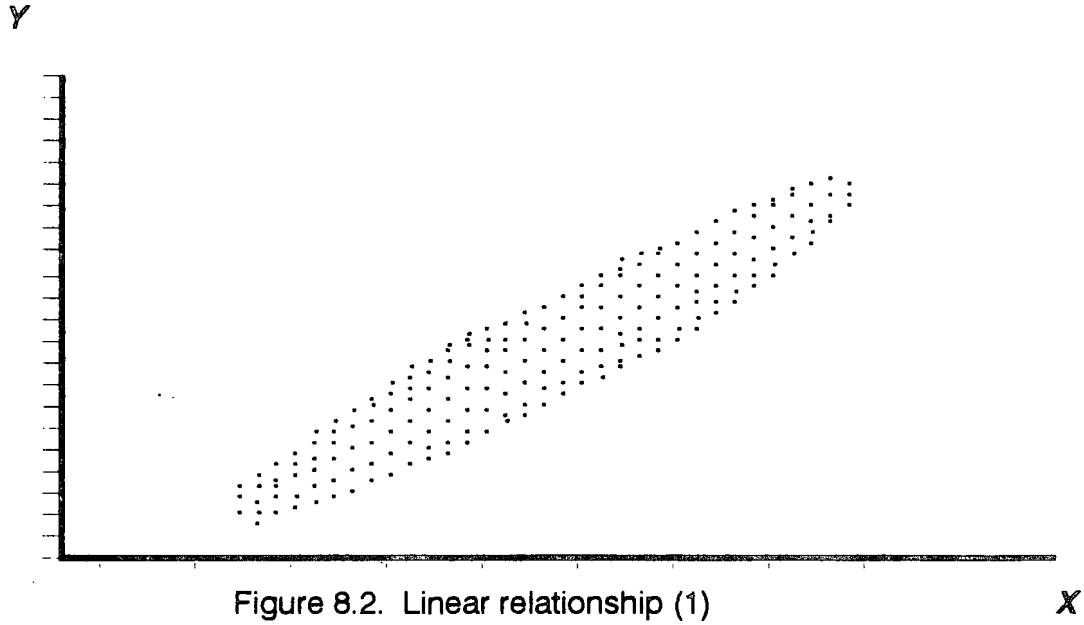

Figure 8.2. Linear relationship (1)

It becomes apparent that if a second group of data showing just as strong a relationship on the same variables, but on a different scale - such as in figure 8.3 - is combined with the first set, the overall distribution is now no longer elliptical in shape and, therefore, it is not as strongly correlated.

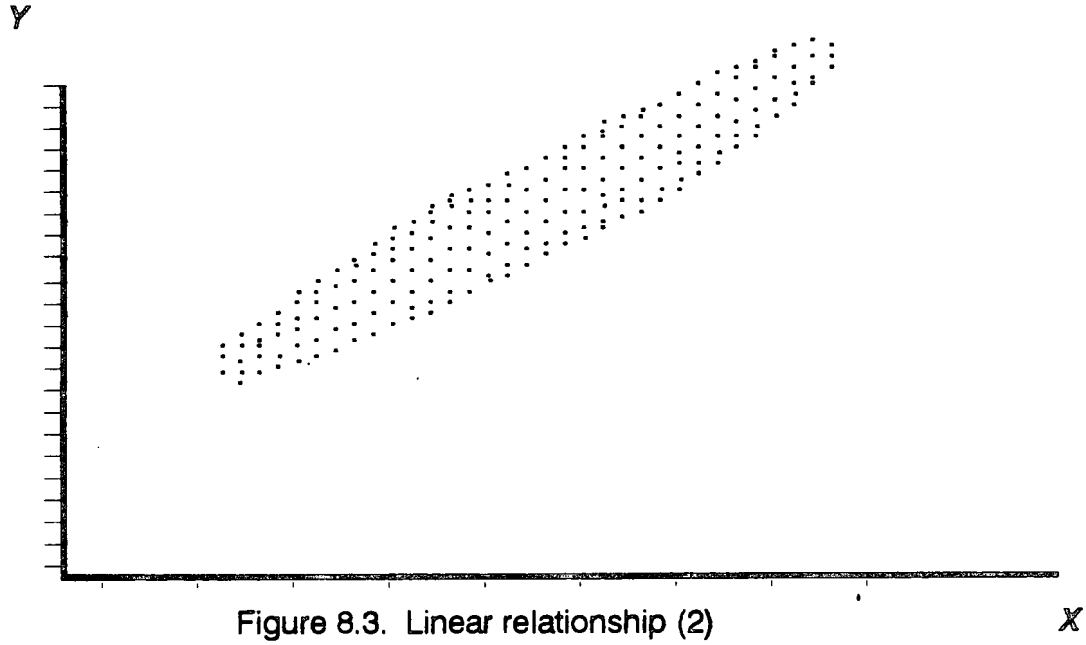

Figure 8.3. Linear relationship (2)

This is indeed what appeared to happen in this study. Although the research population was classified under the broad heading of *Manufacturing Organizations*, it soon became clear that there was a good deal of differences and nuances within and between individual sub-groups and types of manufacturers. This line of thought is pursued in section 4 of this chapter which describes how the analysis was conducted at a more focused level when the sample was stratified according to the SIC codes. Where the number of cases per sample approximated more closely the sample numbers of the overseas studies, the correlations also went much higher and resembled those of these earlier studies.

3. ORGANIZATION STRUCTURE.

Each of the dependent structural variables was submitted in turn to a step-wise multiple regression, and the results are shown below in figure 8.4 to figure 8.9. These tables list the main predictor variables, i.e. those that passed the inclusion criteria for the analysis, in order of their magnitude or importance. The column headed 'Single R' contains the correlation for each variable and the column headed 'R^2' shows the total amount of variance explained. The 'Multiple R' column indicates the multiple correlation coefficient for the combined variables.

The 'F Ratio' column is the F statistic for the null hypothesis that there is no linear relationship between the dependent and independent variables. The final column is the level of significance for each particular null hypothesis. If the F statistic is large and the level of significance is small then the null hypothesis is rejected in favour of the alternate hypothesis that there is a linear relationship between the variables. In nearly every case the F statistic is indeed very large and the level of significance is minuscule. This happy situation is a function of the large sample size since the number of observations (N) is a factor in the calculation of both the F statistic and the level of significance.

The degree to which the independent variables affect the dependent variables is also influenced by the degree to which the independent variables are related to each other. If the causal variables are closely related it would be difficult to isolate one variable's predictive effect on the outcome variable. Ideally, one would prefer that the independent variables are totally independent of each other, for the sake of clear analysis and valid causal inferences.

A measure of the relatedness, or collinearity, was, therefore, included in each regression equation. The measure that was used is a statistic called the Tolerance of a variable. The Tolerance of an independent variable is defined as 1 - R_i where R_i is the multiple correlation coefficient when that particular independent variable is predicted from the other independent variables. So the smaller the Tolerance, the greater the linear relationship between the independent variables; and the greater the Tolerance - i.e. the more it approaches a value of 1,0 - the more independent the variables are of each other.

In the process of analysing the residuals from each regression equation, the 10 most extreme values, or outliers, were isolated as part of the analysis. It was found that removing these outliers from subsequent analyses had the effect of a fair improvement in the clarity of the results with only a very marginal loss of sample size.

3.1. Predicting Specialization

Figure 8.4 illustrates the main independent variables which influenced the structural variable of Functional Specialization. There are four significant predictors which together have a multiple correlation of nearly 0,44 and account for almost 20% of the variance. All four exhibit positively directed relationships. So the amount of Specialization in manufacturing organizations increases in relation to the size of the organizations as well as the age of

the organizations. Furthermore, the more an organization is dependent on its owning group and on other organizations within its owning group, the greater will be the amount of Specialization. Finally, the more turbulent the organization's operating environment, the more likely the organization is to respond by increasing the amount of Specialization in the organization.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Organization Size	0.4007	0.4007	0.1606	84.940	0.0000
Organization Age	0.2009	0.4177	0.1744	46.775	0.0000
Internal Dependence	0.1022	0.4302	0.1851	33.461	0.0000
Operating Environment	0.1576	0.4387	0.1925	26.276	0.0000

Figure 8.4. Predicting Specialization

Of the four predictors, Organization Size is by far the most significant. This is in keeping with most other studies in both advanced economies as well as in developing economies. Certainly, the studies that have followed the Aston methodology have been unanimous in their evaluation of the importance of Size in predicting Specialization. This lead Hickson *et al* (1974) to propound their "Culture-free Hypothesis" regarding the pervasive effect of Organization Size on Specialization and Formalization which extends across cultural barriers.

Intriguingly, though, Technology did not feature at all as a predictor of Specialization in this study. This has not been the case in other studies, particularly third world studies, where Technology usually does feature. Hickson and McMillan (1981) indicated a number of studies where Technology is consistently among the top four causal variables of Specialization. These include Jordan (2nd), the United States (3rd), Egypt (2nd), India (2nd), Britain (3rd), Japan (4th), and Sweden (4th). Although Clark (1990) in his study of Canadian Textile firms also highlighted no signifi-

cant relationship between Technology and Specialization, this seems to be the minority view. Generally, it seems that among developing economies Technology is more prominent in predicting Specialization than it is in developed countries. Shenoy (1981) speculated that the reason for this situation in India lies in the fact that technology is almost always imported and expensive. So specialists are appointed to safeguard valuable assets and firms tend to bureaucratize their controls as technology advances.

Why, then, does Technology not feature as a causal imperative for Specialization in South African manufacturing organizations? There are probably a number of reasons. For example, a history of economic sanctions and a two-tier currency system and strict exchange controls may have discouraged investment and resulted in a capital base of plant and equipment that is old, outmoded, and technologically unsophisticated. The Monitor Company's recent evaluation of the South African economy drew attention to this country's lack of sophisticated machinery as a strategic weakness. (Monitor Co, 1995).

Another possible reason could lie in the First world/Third world dichotomy that was highlighted in the previous chapter. In a labour intensive situation where a large part of the workforce is poorly educated and unsophisticated, it is unlikely that Technology would exercise pressure on the way an organization chooses to structure its activities or that it would spawn specializations.

The Tolerance statistics for the four predictor variables of specialization were :

Organization Size	0,8839
Organization Age	0,9407
Internal Dependence	0,9787
Operating Environment	0,8403

Intrinsically, one would have estimated that the variables of Size, Age, and Internal Dependence would be related to each other to some degree. Yet their tolerance levels were very high, indicating strong independence and lack of collinearity. Almost surprisingly the operating Environment variable exhibited the lowest Tolerance, despite

being the only independent variable which cannot be associated with a specific organization.

3.2. Predicting Formalization.

The most powerful predictor of Formalization in manufacturing organizations is the degree of Internal Dependence; this variable on its own accounted for 12% of the variance and had a correlation of 0,35. So the greater the dependence of an organization on its parent company or owning group, the greater the degree to which its normal day to day activities will be formalized and committed to writing.

Size, Technology and the amount of environmental change are also important factors in determining the amount of Formalization and together they account for a further 15% of the variance, as can be see in figure 8.5. Thereafter the additional variance accounted for

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Internal Dependence	0.3445	0.3445	0.1187	60.078	0.0000
Organization Size	0.2926	0.4582	0.2099	59.121	0.0000
Workflow Integration	0.2889	0.4957	0.2457	48.210	0.0000
Environmental Change	0.2305	0.5228	0.2733	41.659	0.0000
Organization Age	0.1611	0.5315	0.2825	34.802	0.0000
Power Control	−0.2394	0.5386	0.2901	30.030	0.0000

Figure 8.5. Predicting Formalization.

by the final two causal variables becomes smaller and altogether the six predictors have a multiple correlation of 0,54 which accounts for 29% of the variance.

Interestingly, the direction of the relationship with Power Control is negative, so the less an organization is driven by internal political forces, manoeuvring and in-fighting, the more formalized

its structures and procedures will be. Assuming the converse to be true, then a more politically oriented organization is likely to have fewer formalized routines and systems. Bearing in mind that Formalization is an alternative control strategy, particularly with the more advanced and literate sections of the workforce, one would anticipate that the relationship between Power Control and Centralization should be quite strong. In other words, a strongly politically driven organization would rely on Centralization rather than Formalization to maintain control. It is to be expected that the members of the dominant coalition in a very politically active organization would find it difficult to relinquish the reigns of power to facilitate decentralization. Examination of the Centralization variables, which is discussed in section 3.5 below, seemed to indicate that was so.

Comparing the results of the multiple regression with respect to Formalization to similar studies done in other countries, the triad of Internal Dependence, Size and Technology are familiar features of comparable analyses in both developed and developing economies. Again, the situation in this South African study lends support to Hickson (1974) *et al's* Culture-free Hypothesis.

The degree to which the six causal variables were independent of each other or, alternatively, exhibited collinearity is apparent in their Tolerance statistics :

Internal Dependence	0,9709
Organization size	0,8584
Workflow Integration	0,9041
Environmental Change	0,8561
Organization Age	0,9368
Power Control	0,8394

All of the Tolerance statistics are large enough to encourage the belief that the Independent Variables were not related to each other to any significant degree.

3.3. Predicting Standardization.

It will be remembered from the discussion surrounding the operationalizing of the dependent variables in chapter 5 that the measure of Standardization that was eventually used in this study incorporates the concept of Routinization. In other words, it includes not just similarity of tasks but also simplicity and repetition of tasks. Figure 8.6 illustrates the four main predictors of Standardization which, between them, have a multiple correlation of 0,40 and account

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Operating Environment	−0.2983	0.2983	0.0890	43.571	0.0000
Environmental Change	−0.2776	0.3567	0.1272	32.427	0.0000
Organization Age	−0.1275	0.3793	0.1439	24.876	0.0000
Workflow Integration	−0.1647	0.3979	0.1583	20.828	0.0000

Figure 8.6. Predicting Standardization.

for 16% of the variance. All of the relationships are negatively directed.

So the less turbulent the Operating Environment and the fewer the Environmental Changes, the more the degree of standardization and routine. This would make sense in terms of an organization structuring its activities to respond to and capitalize on events in its environment while maintaining the optimum level of internal control. In terms of internal control, organizations tend toward bureaucratization - and a stable and settled environment would allow for the implementation of routine and mechanistic structures and procedures. The other side of the coin is that the more turbulence and change

there is in the environment, the more likely an organization is to respond with organic, flexible and non-routine structures and activities.

The significance of the relationships exhibited by the third and fourth independent variables, i.e. Age and Technology, are much less obvious. It seems that in the South African Manufacturing Sector the younger an organization and the less automated its technology, the more the amount of standardization and routine it will have. These relationships are almost the opposite of classical Organization Theory which normally holds that as an organization develops along its life cycle its technology tends to become more automated and rigid and so standardized controls and routine activities are more prevalent in older organizations.

In a study of 31 South Korean organizations, Kim and Utterback (1983) made the following observations with respect to organizational evolution in a developing country :

> In a developing country, manufacturing organizations in the early stages of an industry are small, have adaptable operations technologies and a mechanistic organization structure, produce infrequent product changes, perform merely assembly of standardized products with low indigenous technical capability and perceive that raw material and equipment suppliers together with government incentive programs are important components of the task environment. Conversely, organizations in the later stage of an industry are large, have relatively more rigid operations technology and relatively organic structure, produce frequent product changes, and perceive that the customers, competitors, and suppliers and government controls that affect technical and capital investments are important components of the task environment.

Although the development of operations technology appears to follow the same direction as in a developed economy, i.e. from adaptive and less automated to rigid and automated, it does so for different reasons. In a developed country the technology is initially non-routine and adaptive to accommodate a dynamic environment and rapid product changes until market position is established and operations technology becomes more standardized and routine to accommodate

larger production runs and to achieve cost advantages in a more stable environment. In a developing country, on the other hand, operations technology is adaptable, not to accommodate product changes since products and technologies are largely imported and standardized, but rather to take advantage of abundant and relatively cheap skilled and semi-skilled labour. (Kim and Utterback, 1983 : 1195).

Kim and Utterback (1983 : 1196) speculated that the differences between developed and developing countries stems from directional differences in environmental change. The environment is hypothesized to evolve from turbulent to more stable in a developed country, while in a developing country it moves from relatively stable to more turbulent as an organization grows and is less protected and comes into contact with foreign competition for the first time. The structuring of its activities would then need to be more organic and flexible at a later stage of its life cycle as a strategic response to environmental pressure as the organization develops and grows.

Examining the collinearity of the independent variables for the regression analysis of the Standardization variable, the following Tolerance statistics emerged :

Operating Environment	0,9068
Environmental Change	0,9007
Organization Age	0,9920
Workflow Integration	0,9663

Tolerances above the 0,9 level again encouraged the belief that the independent variables are not related to each other.

3.4. Predicting Configuration

All six configuration variables are displayed together in figure 8.7 along with the main predictors for each dependent variable. Most overseas studies have concentrated on the three structuring of activi-

ties variables, i.e. Specialization, Formalization and Standardization which, together with Centralization, have formed the basis of most of the discourses on organization structure. Scant attention is paid to Configuration these days, despite the fact that many of the earliest organization studies, for example Woodward (1958), regarded configuration or shape as the entire scope of the study of organization structure. The impact on Configuration of the main predictive variables in this study is outlined below.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Executive Span					
Organization Size	0.2999	0.2999	0.0899	44.086	0.0000
Organization Age	0.1536	0.3136	0.0984	24.273	0.0000
Subordinate Ratio					
Organization Size	0.1342	0.1342	0.0180	8.106	0.0046
Workflow Integration	−0.1183	0.2069	0.0428	9.860	0.0001
Operating Environment	−0.1163	0.2504	0.0627	9.810	0.0000
Organization Depth					
Organization Size	0.3835	0.3835	0.1471	76.041	0.0000
Power Control	0.3748	0.3953	0.1563	40.751	0.0000
Workflow Integration	0.1820	0.4084	0.1668	29.300	0.0000
Management Ratio					
Operating Environment	0.1528	0.1528	0.0234	10.665	0.0012
Organization Age	0.1099	0.1858	0.0345	7.956	0.0004
Environmental Change	0.1287	0.2076	0.0431	6.668	0.0002
Indirect Worker ratio					
Power Control	0.1179	0.1179	0.0139	5.942	0.0152
Organization Age	0.1175	0.1655	0.0274	5.941	0.0029
Clerical worker ratio					
Organization Age	0.1658	0.1658	0.0275	12.602	0.0004
Process Technology	−0.1475	0.2121	0.0449	10.480	0.0000
Operating Environment	0.1197	0.2396	0.0574	9.015	0.0000
Customer Dependence	−0.1045	0.2614	0.0683	8.123	0.0000

Figure 8.7. Predicting Configuration.

Technology - Woodward (1958) also postulated that Technology was the only structural imperative and she believed that the ultimate shape that an organization structure assumes is attributable exclusively to

its operations technology. This hypothesis has been attacked many times, most notably by the Aston researchers (Hickson *et al*, 1969), who proposed that Organization Size was a much more influential predictor of structure.

Certainly, Woodward's view of technological exclusivity is not supported among South African manufacturing organizations either - although Technology does feature among the causal variables of three of the configuration measures, viz:

- the less automated the technology, the greater the ratio of subordinates to first line supervisors. *Job shop and small batch operations would tend to be more labour intensive.*
- the more automated the technology, the greater the organization's depth. *Highly automated technology is more sophisticated and would require more specializations and more layers of support and management staff.*
- the less continuous the production throughput, the greater the ratio of clerical workers. *Discontinuous production throughput has connotations of more complicated scheduling, planning and procurement operations which would mean a concomitant increase in the number of clerical personnel.*

Organization Size - Size features quite strongly in determining the number of subordinates per first line supervisor, the depth of the organization and, finally, the chief executive's span of control. So the bigger the organization, the greater the Chief executive's span of control, the more subordinates there are per first line supervisor, and, finally, the more layers there are in the organization hierarchy.

Organization Age - Insofar as the Age variable is concerned, there are possible indications of, and support for, Parkinson's law. The older a manufacturing organization gets, the greater the number of

its clerical staff and the higher its ratio of indirect workers and managers.

Parkinson formulated his law as a result of studies that he conducted with the British Royal Navy. He discovered that over a fourteen year period from 1914 to 1928 total personnel in the navy decreased by 32% while the number of new ships commissioned also decreased by 68 percent. This apparently had no bearing on the numbers of administrative and support staff and the number of on-shore clerks and officials increased by 40% while the officer corps increased an amazing 78 percent! (Robbins, 1987 : 113 - 116).

This tendency for an organization's support and administrative functions to grow over time has been demonstrated in many other studies, although, unlike the Royal Navy, in commercial organizations it is usually accompanied by an increase in organization size and activity level. It appears, though, that decreases in size and activity level are not often accompanied, certainly in the short term, by a concomitant decrease in the size of the administrative component. (Robbins, 1987 : 116). Inkson *et al* (1970) speak of a 'ratchet mechanism' which sees increases in size resulting in increases in structuring of activities, but decreases in size not resulting in less structuring.

Environment - The effect of the Operating Environment as a predictor is apparent on three of the Configuration ratios - management, first line subordinates, and clerical workers. Environmental Change is also evident as a predictor in the Management Ratio.

So the greater the amount of environmental turbulence in manufacturing organizations, the more managers, first line subordinates and clerical workers they tend to have. This is a curious finding and its significance was not immediately clear. An organization could well respond to increased turbulence and change by appointing a larger management corps in an effort to manage and control the

environment's influence on the organization - but why would it have more clerical workers and first line subordinates? Perhaps it could be the influence of a third or intervening variable such as the type of industry in which the organization is engaged. In other words, some industries may function in more turbulent, competitive environments but, at the same time, they could lend themselves to more labour intensive methods which employ more direct and lower level workers. Examination of individual industries and industry groups according to their SIC codes is pursued in section 4 below.

Power control - The political nature of the Power Control variable is illustrated by its effects on Configuration. The two variables affected by Power Control are Organization Depth and the Indirect Worker Ratio. In other words, the more politically driven an organization is the more layers of management it will have and the greater will be the number of support staff. Both of these effects smack of nepotism and reward for doing the bidding of the dominant coalition. In addition, the creation of artificial layers of authority and support-type jobs will have the effect of stacking the deck in favour of the dominant coalition in terms of creating a power base, as well as in maintaining centralized control. In support of this assertion, Centralization and Power Control were found to be significantly related to each other, as will become evident in the following section.

Collinearity did not appear to be a problem among the independent variables in each of the multiple regression equations of the Configuration dependent variables. Only two variables had Tolerances marginally below the 0,90 level and more than half showed Tolerance statistics of 0,95 or greater.

3.5. Predicting Centralization

The results of the multiple regression of the three measures of Centralization that were used in this study are illustrated in a combined

format in figure 8.8. It will be recalled that Autonomy is an overall measure of decentralization, while the other two scales measured centralization. Specifically, the degree to which policy decisions, on one hand, and first-line supervisory decisions, on the other, were centralized.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Autonomy					
Internal Dependence	−0.2889	0.2889	0.0834	40.604	0.0000
Operating Environment	0.1502	0.3442	0.1185	29.898	0.0000
Power Control	−0.1160	0.3597	0.1294	21.999	0.0000
Policy Decision Level					
Power Control	0.3415	0.3415	0.1167	58.895	0.0000
Organization Size	−0.2746	0.4105	0.1685	45.082	0.0000
Environmental Change	−0.2571	0.4288	0.1839	33.342	0.0000
Internal Dependence	−0.1239	0.4447	0.1977	27.298	0.0000
Workflow Integration	−0.2269	0.4563	0.2082	23.248	0.0000
Customer Dependence	0.0806	0.4641	0.2154	20.176	0.0000
Organization Life Cycle	−0.1049	0.4716	0.2224	17.974	0.0000
First line discretion					
Power Control	0.2746	0.2746	0.0754	36.385	0.0000
Organization Age	−0.1091	0.2966	0.0880	21.459	0.0000
Environmental Change	−0.1860	0.3125	0.0976	16.014	0.0000

Figure 8.8. Predicting Centralization

Taken as a whole, there were no real surprises in the results of the multiple regression of Centralization - except, perhaps, for the absence of Organization Size as a predictor of Autonomy. The factors that spark decisions to centralize or decentralize seemed to be quite consistent with the accepted wisdom that has been inferred from other studies, although the sequence may sometimes be a little different to that which is followed in a developed economy.

Insofar as Autonomy was concerned, there were three significant predictors of the overall decentralization or autonomy of organizat-ions. These were Internal Dependence, the Operating Environment and,

finally, Power Control. The relationships between Autonomy and both Dependence and Power Control were negatively directed, while the relationship with the Operating Environment was positive. So the less dependent on its owning company or holding group and the less politically driven an organization was, the more autonomous and decentralized it also was. Also, the more turbulent the operating environment, the more autonomous was the organization.

It has become accepted that in a very turbulent environment flexibility and speed of reaction are essential elements to an organization's survival - and centralized control and decision making hampers both speed and flexibility. Nevertheless, a typical short-term, or crisis, reaction to intensified environmental turmoil is to enhance centralization and direct management control. One would, therefore, expect the Power Control variable to be associated with centralization in short term crisis situations only. In the longer term, a rapidly changing environment would produce pressure to decentralize decision making in order to enhance the pace and effectiveness of responses to environmental changes. This situation appears to be supported by the regression analysis of the Autonomy variable. In other words, a manufacturing organization which : (i) functions in a turbulent environment, (ii) is subject to less direct rule and control from its dominant coalition, and (iii) is less dependent on, or influenced by, its controlling group or holding company will respond by decentralizing its controls and decision making.

Looking at the Centralization of Policy Decisions, there were several significant predictors, which altogether presented a multiple correlation of 0,47 accounting for 22% of the variance. By far the greatest predictor was Power Control which had a correlation of 0,34 and accounted for 12 percent of the variance. This finding reinforces the assertion made in Section 3.2. **Predicting Formalization** that organizations which are very political and exhibit a high degree of Power Control would find it difficult to decentralize. This seems to be especially so for an organization's policy decisions.

Taking all of the independent variables together, one is able to put together a profile of "typical" organization that centralizes its policy decisions :

> *It is a small organization, probably near the beginning of its life cycle. It functions in a fairly stable environment, probably because it is protected from overseas competition by government policies and import barriers. It has little or no dependence on a holding group or parent company, so its structure and ownership are still quite simple and the influence of the owner, chief executive, or dominant coalition, as the case may be, is very direct. It is very dependent on its largest customer. The technology employed is at an elementary stage and is relatively unsophisticated and unautomated. One would expect that as the organization develops along its life cycle curve and becomes bigger and more complex, so the pressure to decentralize would also increase.*

It is interesting to note the similarity between this impression of a South African manufacturing organization at the beginning of its life cycle and the similar picture that was sketched on page 216 by Kim and Utterback (1983) of young organizations in South Korea. So it seems that there could well be common factors in the growth of industries in developing countries which are different to the accepted sequence and circumstances that prevail in developed economies.

The final measure of Centralization concerned First Line Discretionary decisions. Three independent variables were significant in predicting centralization of lower level operating decisions. They were Power Control, Organization Age, and Environmental Change. These findings corroborated the results of the regression analyses of both the Autonomy and Policy Decision variables. Again, Power Control exercised the greatest influence on centralization and organizations that sought to centralize their lower level decisions also exhibited a high degree of Power Control. They also tended to

be younger and to function in a more stable environment with less frequent environmental change. All in all, the situation was not dissimilar to that of organizations that centralize their policy decisions.

An examination of the Tolerance statistics indicated a generally acceptable level of collinearity between the predictor variables in the analysis of the centralization variables. The two lowest Tolerances both occurred in the Policy Decision regression equation and they were for Power Control at 0,83 and Environmental Change at 0,86. There may, in fact, be a degree of collinearity between these two independent variables in that the reaction to perceived environmental threat or turbulence is often the consolidation and centralization of power by the organization's ruling alliance, i.e. the crisis reaction.

Other than these two variables, all of the other independent variables in all three regression equations scored above the 0,90 level.

3.6. Predicting Organicity.

The four main predictors of Organicity are displayed in figure 8.9.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Power Control	−0.2112	0.2221	0.0446	20.820	0.0000
Internal Dependence	−0.1586	0.2778	0.0772	18.609	0.0000
Environmental Change	0.1859	0.3006	0.0904	14.704	0.0000
Organization Size	−0.0630	0.3237	0.1048	12.958	0.0000

Figure 8.9. Predicting Organicity

It will be seen that all four together had a multiple correlation coefficient of 0,32 and accounted for nearly 11 percent of the

variance.

Robbins (1987 : 498) defined an organic structure as being flexible and adaptive with emphasis on lateral communication, non-authority based influence, and loosely defined responsibilities.

The relationship between Power Control - which was the most significant of the independent variables - and Organicity was negatively directed. This is to be expected because a high degree of political machination and domination by a ruling clique would be anathema to the open communication and free delegation of authority and power that characterises an organic structure.

Other predictors of organic structure were independence from a controlling group or holding company, smaller organizational size, and an environment characterised by a high degree of change and uncertainty. All of these are factors which contribute to what is pretty much the 'classical' picture of organically structured organizations functioning in a turbulent environment.

The concept of environmental turbulence is central to any discussion on organicity. Burns and Stalker (1961), who coined the labels *Organic* and *Mechanistic* to describe organization structures, were among the first researchers to discover that organization structures that existed in dynamic environments were very often quite different from those that were dominant in a more stable and settled setting.

Burns and Stalker (1961) recognised that the mechanistic and organic forms were ideal types and that they constituted polarities along a continuum. No organization is purely organic or purely mechanistic but, rather, is inclined toward one pole or the other. Efforts to test their research conclusions have met with general support throughout the world (Robbins, 1987 : 154), and this study is no exception.

The relationship between Organicity and Environmental Change was the only positively directed one to emerge from the regression equation. It will be remembered that the scale which measured Environmental Uncertainty was an amalgam of environmental change and unpredictability. And so this study has confirmed that the nexus between environmental uncertainty and organic structures also exists in South African organizations - at least in a milieu typified by a large amount of Environmental Change.

Finally, looking at the Tolerance statistics for the independent variables, the following picture emerges :

Power Control	0,8544
Internal Dependence	0,9879
Environmental Change	0,8599
Organization Size	0,9594

Again, the lowest Tolerances were for the Power Control and Environmental Change variables, indicating a possible degree of simultaneous occurrence and collinearity - for the reasons discussed in the previous section; i.e. the reaction to perceived environmental threat or turbulence is often the consolidation of power by the organization's dominant coalition, i.e. the crisis reaction.

Generally it was felt that the levels of Tolerance were sufficient to draw valid conclusions.

3.7. Predicting Structure : Concluding Remarks

The above section concludes the discussion with respect to the possible predictive relationships that exist between the dependent and independent variables that were catalogued at the beginning of this chapter. A number of trends are apparent and these are briefly explored below. All of the dependent variables and their main causal variables are illustrated in figure 8.10 overleaf.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.4007	0.4007	0.1606	84.940	0.0000
Organization Age	0.2009	0.4177	0.1744	46.775	0.0000
Internal Dependence	0.1022	0.4302	0.1851	33.461	0.0000
Operating Environment	0.1576	0.4387	0.1925	26.276	0.0000
Formalization					
Internal Dependence	0.3445	0.3445	0.1187	60.078	0.0000
Organization Size	0.2926	0.4582	0.2099	59.121	0.0000
Workflow Integration	0.2889	0.4957	0.2457	48.210	0.0000
Environmental Change	0.2305	0.5228	0.2733	41.659	0.0000
Organization Age	0.1611	0.5315	0.2825	34.802	0.0000
Power Control	−0.2394	0.5386	0.2901	30.030	0.0000
Standardization					
Operating Environment	−0.2983	0.2983	0.0890	43.571	0.0000
Environmental Change	−0.2776	0.3567	0.1272	32.427	0.0000
Organization Age	−0.1275	0.3793	0.1439	24.876	0.0000
Workflow Integration	−0.1647	0.3979	0.1583	20.828	0.0000
Executive Span					
Organization Size	0.2999	0.2999	0.0899	44.086	0.0000
Organization Age	0.1536	0.3136	0.0984	24.273	0.0000
Subordinate Ratio					
Organization Size	0.1342	0.1342	0.0180	8.106	0.0046
Workflow Integration	−0.1183	0.2069	0.0428	9.860	0.0001
Operating Environment	−0.1163	0.2504	0.0627	9.810	0.0000
Organization Depth					
Organization Size	0.3835	0.3835	0.1471	76.041	0.0000
Power Control	0.3748	0.3953	0.1563	40.751	0.0000
Workflow Integration	0.1820	0.4084	0.1668	29.300	0.0000
Management Ratio					
Operating Environment	0.1528	0.1528	0.0234	10.665	0.0012
Organization Age	0.1099	0.1858	0.0345	7.956	0.0004
Environmental Change	0.1287	0.2076	0.0431	6.668	0.0002
Indirect Worker ratio					
Power Control	0.1179	0.1179	0.0139	5.942	0.0152
Organization Age	0.1175	0.1655	0.0274	5.941	0.0029
Clerical worker ratio					
Organization Age	0.1658	0.1658	0.0275	12.602	0.0004
Process Technology	−0.1475	0.2121	0.0449	10.480	0.0000
Operating Environment	0.1197	0.2396	0.0574	9.015	0.0000
Customer Dependence	−0.1045	0.2614	0.0683	8.123	0.0000
Autonomy					
Internal Dependence	−0.2889	0.2889	0.0834	40.604	0.0000
Operating Environment	0.1502	0.3442	0.1185	29.898	0.0000
Power Control	−0.1160	0.3597	0.1294	21.999	0.0000
Policy Decision Level					
Power Control	0.3415	0.3415	0.1167	58.895	0.0000
Organization Size	−0.2746	0.4105	0.1685	45.082	0.0000
Environmental Change	−0.2571	0.4288	0.1839	33.342	0.0000
Internal Dependence	−0.1239	0.4447	0.1977	27.298	0.0000
Workflow Integration	−0.2269	0.4563	0.2082	23.248	0.0000
Customer Dependence	0.0806	0.4641	0.2154	20.176	0.0000
Organization Life Cycle	−0.1049	0.4716	0.2224	17.974	0.0000
First line discretion					
Power Control	0.2746	0.2746	0.0754	36.385	0.0000
Organization Age	−0.1091	0.2966	0.0880	21.459	0.0000
Environmental Change	−0.1860	0.3125	0.0976	16.014	0.0000
Organicity					
Power Control	−0.2112	0.2221	0.0446	20.820	0.0000
Internal Dependence	−0.1586	0.2778	0.0772	18.609	0.0000
Environmental Change	0.1859	0.3006	0.0904	14.704	0.0000
Organization Size	−0.0630	0.3237	0.1048	12.958	0.0000

Figure 8.10. Stepwise Multiple Regression : All SIC codes (N =458)

The frequency with which each independent variable appears in the overall analysis is summarised below, together with the mean correlation coefficient for each variable on every regression equation where it was significant :

Independent Variable	Frequency	Mean R
Organization Age	8	0,1432
Power control	7	0,2393
Organization Size	7	0,2641
Environmental Change	6	0,2109
Operating Environment	6	0,1658
Workflow Integration	5	0,1962
Internal Dependence	5	0,2036
Customer Dependence	2	0,0926
Organization Life Cycle	1	0,1049
Process Technology	1	0,1475

The importance of each causal variable in an overall sense must be seen as a combination of both the frequency with which it occurred and the strength of the relationships where it did occur. From the above table it becomes apparent that the most frequently occurring independent variables are not necessarily also the ones exhibiting the strongest relationships with the dependent structural variables.

In order to gauge the *combined* effects of both the frequency and strength of the independent variables, an elementary index was devised which consisted simply of the product of these two factors, i.e.

Importance Index = Frequency x Mean R

Of course, the same effect can be obtained by simply summing all of the correlation coefficients of each independent variable every time it appears as a predictor. The results of applying this simple rule

of thumb is illustrated below; where these variables have been arranged in descending order of importance :

Independent Variable	Importance Index
Organization Size	1,85
Power control	1,68
Environmental Change	1,27
Organization Age	1,15
Internal Dependence	1,02
Operating Environment	0,99
Workflow Integration	0,98
Customer Dependence	0,19
Process Technology	0,15
Organization Life Cycle	0,10

Despite the simplicity and imperfection of this Importance Index it, nevertheless, provides a very useful indicator of broad trends. These are considered below.

Organizational Size. Looking at the South African manufacturing sector as a whole, one can see that Organization Size seems to be the most important predictor of organization structure. This is a finding which is in keeping with most other similar studies that have been carried out in both advanced and less developed countries or economies, particularly those that have followed the Aston methodology. The point needs to be made again, though, that the pervasiveness of size as an independent variable does not necessarily imply causality - or even that the relationship is unidirectional. Size may indeed cause structure, but, equally, structure may actually cause size. A longitudinal study would have to be carried out before causal inferences could be made.

Power Control. Interestingly, the Power Control variable - which has not been tested to any great extent in other studies - came through as a very powerful predictor of structure; even more

powerful than Internal Dependence or any of the environmental variables. It is important to grasp, however, that Power Control as a structural imperative does not exclude the influence of the more 'traditional' causal variables of size, environment, dependence and technology. In other words, it is quite possible that size, technology, dependence and the environment would set the parameters within which the power control imperative then sets to work in determining organizational structure.

Environment. The influence of the environment on organizations in the manufacturing sector was, as expected, also quite significant. Uncertainty in terms of the amount of environmental change exercised the most influence. Turbulence within the operating environment exercised less influence but was still important. Curiously, the Unpredictability measure did not feature at all in the overall analysis, although it was significant in some specific areas. This will become evident later in this chapter when the results of an analysis stratified by SIC codes is outlined.

Organization Age. The tendency of organizations to move toward bureaucratization over time, and to increase structuring as a means of control while decentralizing, has been well documented and so the influence of age as a predictor of structure in manufacturing organizations is to be expected. Also the effects of Parkinson's law are germane, as was seen earlier in this chapter in the context of the Configuration variables.

Internal Dependence. The overall importance of internal dependence, i.e. dependence on a holding group or company, is also consistent with other studies in many parts of the world. The original Aston studies defined dependence in very broad interorganizational terms and included dependence on *all* organizations external to the unit under study. Later studies, however, separated the effects of *inter*organizational from *intra*organizational dependence. This procedure was also followed in this study and the overall trend

indicated that this method was probably more sound. While the effects of Internal Dependence were quite pronounced, only one of the external organizational measures - that of dependence on customers - showed any significance at all and the other - that of dependence on suppliers - did not feature in any of the regression equations.

Technology. The last word on this discussion of broad trends in the manufacturing sector is reserved for Technology. It will be remembered that one of the reasons why manufacturing organizations were chosen as the research population for this study was the belief that the effects of technology would be more readily apparent than in, say, a service or retail environment. The two measures of technology that were used were :

- *Workflow Integration* - which measured the automaticity of the manufacturing process, and
- *Process Technology* - which measured the throughput continuity (and flexibility) of the manufacturing process.

Both of the measures of Technology were important predictors of structure in manufacturing organizations, although the degree of automation appeared to exercise a lot more influence than the continuity or flexibility of throughputs. In the analysis of organizations by their SIC codes some interesting nuances also emerged with respect to Technology.

4. SUBGROUPS IN THE MANUFACTURING SECTOR.

In the following sections a second analysis of the entire research sample, stratified according to each organization's SIC code, is presented. The procedure that was followed was the same as that for the combined sample. Each of the structural variables was subject to a multiple linear regression analysis in respect of each group of organizations that comprised every SIC code. This time, however, it was decided to dispense with any form of examination of the residuals from the

regression equations. Similarly, it was not felt necessary to calculate the Tolerance statistic for each independent variable. Collinearity, or the lack of it, had been quite well established in the main analysis.

The full list of industries that make up the SIC codes is presented as Annexure 1. Shown below is a summary list of SIC codes and their descriptive headings. In addition, four combinations of SIC codes are presented which, it was felt, could logically be grouped together and analysed as additional sub-groups. There was also a group of 10 organizations which fell under the heading of 'other'. It was not included in this portion if the analysis.

SIC Code	Type of Industries	Number of Organizations
31	Food, Beverage and Tobacco	81
32	Textile, Clothing and Leather	69
33	Wood and Wood Products	20
34	Paper, Paper Products, Publishing & Printing	40
35	Chemicals, Petroleum, Rubber & Plastic Products	68
36	Non-metallic Mineral Products	29
37	Ferrous & Non-ferrous Metal Basic Industries	18
38	Fabricated Metal Products, Machinery and Equipment	123
33 & 34	Wood, Pulp, Paper and Publishing	60
36 & 37	Primary Materials Manufacturing	47
37 & 38	Metals, Machinery and Engineering	141
36 to 38	Metallic & Non-metallic Materials, and Machinery	170

The mean raw scores of every independent and dependent variable is presented overleaf as figure 8.11, which provides an overview of comparative differences within the manufacturing sector. In terms of the first three variables of Organization Life Cycle Stage, Size and Age the responding organizations were pretty homogeneous. On average they were in the maturity stage of their life cycle curves, their average size was about 500 people, and their average ages were between 20 and 29 years.

Looking at dependence, Textile and Leather firms were the least

internally dependent on a holding group or owning company and Paper, Publishing and Printing were the most internally dependent. Externally,

Variable	SIC 31	SIC 32	SIC 33	SIC 34	SIC 35	SIC 36	SIC 37	SIC 38	Total Sample
Organization Life Cycle	3.2	3.0	3.2	3.1	3.2	3.3	3.3	3.2	3.2
Organization Size	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Organization Age	4.5	4.1	4.1	4.4	4.4	4.7	4.4	4.4	4.4
Internal dependence	8.6	7.4	7.8	9.5	9.0	8.2	8.8	8.5	8.5
Supplier Dependence	2.7	2.7	2.8	3.1	2.7	2.3	3.1	2.6	2.7
Customer Dependence	2.1	2.3	2.8	2.1	2.1	2.0	2.4	2.3	2.2
Workflow Integration	6.0	5.1	4.8	6.5	6.2	5.2	5.9	4.9	5.5
Process Technology	54.7	47.9	55.4	50.3	53.1	59.0	50.7	46.9	50.9
Power Control	35.4	35.8	37.8	33.7	32.6	33.3	32.6	33.1	34.1
Environmental Change	25.8	25.6	26.2	26.1	26.3	25.9	26.6	26.4	26.1
Unpredictability	19.1	22.5	20.7	19.2	18.8	17.4	19.4	20.0	19.8
Operating Environment	12.5	13.1	12.1	12.4	12.8	11.6	12.9	13.4	12.8
Functional Specialization	13.1	11.9	12.6	12.3	13.7	13.3	12.6	13.3	12.9
Formalization	12.8	9.9	9.6	12.4	14.4	13.3	13.6	13.1	12.6
Standardization	13.3	13.5	14.8	13.6	12.7	12.9	13.3	12.9	13.2
Executive Span	7.2	6.9	5.9	7.4	6.2	6.5	6.3	7.0	6.8
Subordinate Ratio	18.6	21.3	23.8	18.4	14.8	21.1	18.3	18.2	18.7
Organization Depth	6.2	6.5	6.4	4.9	6.0	5.8	6.3	5.3	5.8
Management Ratio	11.5	9.3	8.6	12.4	14.4	13.6	9.9	12.2	11.8
Indirect Worker Ratio	44.4	39.5	49.4	36.5	35.5	45.6	38.9	37.2	39.6
Clerical Worker Ratio	8.2	7.2	4.7	11.3	11.1	7.0	5.9	11.0	9.2
Autonomy	16.6	20.0	16.9	19.0	18.7	18.1	17.9	19.6	18.6
Policy Decision Level	10.1	11.5	11.5	9.9	10.0	10.1	10.4	10.0	10.3
First Line Discretion	36.2	38.8	34.7	34.2	34.2	35.2	35.2	34.7	35.5
Organicity	4.2	4.2	4.4	4.4	4.1	4.4	4.5	4.3	4.3

Figure 8.11. Mean Scores of All Independent and Dependent Variables.

Paper, Publishing and Printing, together with Ferrous & Non-ferrous Metal Industries, were the most dependent on their largest supplier; while Food, and Textile and Leather, were the least dependent on a single supplier. Examining dependence on their single largest customer, most industries were in the region of 9% dependent on their largest customer with the exception of Wood and Wood Products which showed closer to 35% dependence on its biggest customer.

In terms of Technology, companies in the Wood Products category scored the lowest on Workflow Integration or automaticity, but very highly on

the other Technology measure - Process Technology, or throughput continuity. This situation illustrates the difference between the two Technology measures. Whereas woodworking machinery may be fairly unsophisticated in terms of sawing, milling, planing and shaping, the Process Technology in the Wood Products industry would tend towards mass production of throughput with strong elements of continuous process. The highest average score on Workflow Integration occurred in the Paper, Paper Products, Publishing & Printing industry while the highest Process Technology score was in the Non-metallic Mineral Products category. The Fabricated Metal Products, Machinery and Equipment group scored quite low on both measures of Technology; speaking of an industry with relatively uncomplicated production machinery and production throughput which tends toward batch and custom units of production.

In terms of the Power Control variable, there was not much differentiation between the various groups. Overall, the Wood and Wood Products industry is marginally the most politically driven while both the Chemicals, Petroleum, Rubber & Plastic Products as well as the Ferrous & Non-ferrous Basic Metal Industries were the least politically driven.

Taking all three of the environmental measures together, the Textile, Clothing and Leather industries seemed to be functioning in the most turbulent environment, with the Non-metallic Mineral Products group in the least turbulent. No doubt a good deal of the perceived turmoil in the Textile, Clothing and Leather companies' environment is directly related to the fashion industry.

Turning to the dependent variables and looking firstly at the structuring of activities, the Chemicals, Petroleum, Rubber & Plastic Products group exhibited the highest average on specialization, while textile Clothing and Leather had the lowest. The Wood and Wood Products group had interesting average scores on formalization and standardization: showing the highest score on standardization but the lowest on formalization. This recalled the earlier discussion that in many cases in South African organizations, standardization and not formalization is the most viable control strategy because of the low literacy levels in

some labour intensive industries. This may also be reflected in the Wood industry's high subordinate ratio and its high indirect worker ratio, as well as its greater organization depth and smaller numbers of managers and clerical workers.

The flattest organizations apparently turned up in the Paper, Paper Products, Publishing & Printing group where the broadest CEO span of control and the fewest organization levels occurred. The Chemicals, Petroleum, Rubber & Plastic Products group showed the second narrowest CEO span of control and the smallest first line subordinate ratio as well as the smallest indirect worker ratio. Nevertheless, it had the largest ratio of managers and the second largest ratio of clerical workers - a situation that is probably in keeping with the high degree of structuring of activities in this industry.

The situation regarding the three measures of Centralization is intriguing with respect to the Textile, Clothing and Leather industry which scored highest on Autonomy, or decentralization, but, at the same time, also scored highest on the centralization of both policy decisions as well as first line discretionary decisions. This situation must be read in conjunction with this group's low average score on Internal Dependence and reinforces the value of distinguishing between the types of decisions that are centralized. So organizations in the Textile, Clothing and Leather industry are largely autonomous from centralized control by a holding group or owning company and, within this autonomy, individual units generally choose to centralize their own policy and first line discretionary decisions.

Looking at the final dependent variable, Organicity, the scores of all the SIC groups are generally quite similar and tend slightly toward the organic, rather than mechanistic, pole on a seven-point bipolar scale. The Ferrous & Non-ferrous Metal Basic Industries group tended to be the most organic and the Chemicals, Petroleum, Rubber & Plastic Products group tended to be the least organic or the most mechanistic.

This concludes the general discussion of the raw score means of all the dimensions that were measured in this study. Obviously, no firm conclusions can be drawn without comparative norms and statistical parameters to compare them with. Nevertheless, they were useful in order to gain an overall 'feel' for the situation in the manufacturing sector.

In the following sections a multiple regression analysis is presented for each SIC code, as well as for the four combination groups, in an effort to come to grips with the possible linkages between the dependent and independent variables at a disaggregated level. Although this analysis is on a more scientific elevation than the above general discussion, it is still accepted that each descriptive summary and treatment will not be to the same analytical depth as that presented in the main analysis of the total sample. No doubt, the detailed analysis of each SIC code presents fertile ground for future possible research directions. The format followed is similar to that of the main analysis except that all of the variables for each SIC code will be shown on a single diagram.

4.1. SIC code 31 : Food, Beverages, and Tobacco.

The first SIC subgroup to be analysed was that of the food, Beverage and Tobacco industries. The main predictive relationships are illustrated in figure 8.12 overleaf. There were 81 organizations in this category. Three of the dependent variables failed to reveal any kind of relationship at all at the 0,05 level of significance. They were the Configuration variables of the CEO's Span of Control and the Clerical Worker Ratio, as well as the Organicity variable.

Structuring of Activities : Size, Age and Technology were the main predictors of Specialization, while Technology and Age were the variables associated with Formalization. Standardization, on the other hand, was mainly influenced by the organizations' Operating Environment and Life Cycle stage, and the relationship with the

Operating Environment was negatively directed. So a less turbulent environment encouraged more standardization.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.3616	0.3616	0.1307	11.886	0.0009
Organization Age	0.3355	0.4469	0.1996	9.730	0.0002
Workflow Integration	0.3234	0.5068	0.2568	8.860	0.0000
Process Technology	−0.1981	0.5561	0.3292	8.500	0.0000
Formalization					
Workflow Integration	0.3248	0.3248	0.1055	9.318	0.0031
Organization age	0.2706	0.4059	0.1648	7.694	0.0009
Standardization					
Operating Environment	−0.4203	0.4203	0.1767	16.958	0.0001
Organization life cycle	0.2472	0.4835	0.2337	11.897	0.0000
Executive Span		No significant correlations at the 0.05 level			
Subordinate Ratio					
Operating Environment	−0.2749	0.2749	0.0755	6.455	0.0130
Organization life cycle	0.2263	0.3526	0.1243	5.536	0.0056
Organization Depth		No significant correlations at the 0.05 level			
Management Ratio					
Power Control	0.2621	0.2621	0.0687	5.826	0.0181
Indirect Worker ratio					
Environmental Change	0.3036	0.3026	0.0916	7.962	0.0060
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy					
Internal Dependence	−0.3005	0.3005	0.0903	7.844	0.0064
Workflow Integration	0.2686	0.4079	0.1664	7.786	0.0008
Supplier Dependence	0.1161	0.4581	0.2099	6.818	0.0004
Policy Decision Level					
Environmental Change	−0.3237	0.3237	0.1048	9.246	0.0032
Supplier Dependence	−0.1844	0.4020	0.1616	7.518	0.0010
Organization Size	−0.2378	0.4620	0.2135	6.965	0.0003
First line discretion					
Organization Size	−0.2344	0.2344	0.0549	4.591	0.0352
Organicity		No significant correlations at the 0.05 level			

Figure 8.12. Stepwise Multiple Regression : SIC code 31. (N = 81)

So the larger and older the organizations in this group, and the more automated their Technology, the more Specialization they showed. The relationship of Specialization with Process Technology is negatively directed - so the more discontinuous and flexible the throughput, the

more the degree of Specialization. Formalization also increased with technological automation and with Organization Age. Finally, looking at Standardization, the more settled the organization's operating environment, and the more mature the organization in terms of its life cycle stage, the more the organization tends to increase its Standardization as a control strategy.

Configuration : Only three Configuration variables exhibited significant relationships at the default level. The first line subordinate ratio was associated with a less turbulent operating environment as well as a more mature Life Cycle stage. The Management Ratio was positively related to Power Control, so the more politically driven organizations in the Food, Beverage and Tobacco industry tended to have the highest number of managers. Finally, an environment that changed frequently was reflected in a greater number of indirect workers in these organizations.

Centralization : Autonomy, or decentralization, was predicted by Internal Dependence, workflow Integration, and Supplier Dependence. The relationship with Internal dependence was negatively directed so the less dependent organizations were on a holding group or company, the greater their autonomy. Insofar as Policy Decisions were concerned, all three of the significant independent variables were negatively directed. So the less the amount of environmental change, and the less dependent the organization is on its biggest supplier, and the smaller the organization, the more it will centralize its policy decisions. The final centralization measure, First Line Discretion, showed a clear link only with Organization Size. So, in smaller organizations in the Food, Beverage and Tobacco industry, first line discretion tends to be limited.

4.2. SIC code 32 : Textile, Clothing and Leather.

In the Textile, Clothing and Leather SIC group there were 69 Organizations. There were two areas that elicited no relationships at all at the default level of significance. These were the Indirect Worker Ratio and the Autonomy measure of decentralization. The main

relationships are shown in figure 8.13.

Structuring of Activities : Specialization was predicted only by Internal Dependence - the more dependent on its owning group or company the more Specialization an organization exhibited. Internal

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Internal Dependence	0.2382	0.2382	0.0567	4.030	0.0487
Formalization					
Environmental Change	0.4468	0.4468	0.1997	16.714	0.0001
Internal Dependence	0.3801	0.5401	0.2917	13.590	0.0000
Workflow Integration	0.3105	0.5865	0.3440	11.363	0.0000
Standardization					
Operating Environment	−0.2956	0.2956	0.0874	6.417	0.0136
Executive Span					
Organization Size	0.4638	0.4638	0.2151	18.365	0.0001
Customer Dependence	0.3422	0.5348	0.2860	13.216	0.0000
Subordinate Ratio					
Organization Size	0.2668	0.2668	0.0712	5.135	0.0267
Unpredictable Environment	−0.2395	0.3934	0.1548	6.043	0.0039
Organization Depth					
Internal Dependence	−0.2859	0.2859	0.0817	5.966	0.0172
Management Ratio					
Operating Environment	0.3894	0.3894	0.1516	11.975	0.0009
Internal Dependence	−0.1415	0.4593	0.2109	8.820	0.0004
Indirect Worker ratio		No significant correlations at the 0.05 level			
Clerical worker ratio					
Supplier Dependence	−0.2669	0.2669	0.0712	5.139	0.0266
Operating Environment	0.2516	0.3532	0.1248	4.704	0.0123
Autonomy		No significant correlations at the 0.05 level			
Policy Decision Level					
Power Control	0.4171	0.4171	0.1740	14.111	0.0004
Organization Size	−0.3056	0.4898	0.2399	10.416	0.0001
First line discretion					
Organization Age	−0.3103	0.3103	0.0962	7.138	0.0095
Environmental Change	−0.2813	0.4169	0.1738	6.942	0.0018
Organicity					
Operating Environment	0.2377	0.2377	0.0565	4.103	0.0492

Figure 8.13. Stepwise Multiple Regression : SIC code 32. (N = 69)

Dependence also figured in predicting Formalization, together with Environmental Change and Workflow Integration. So an organization dependent on its owning group, functioning in a changing environment,

and with more sophisticated and automated technology would also tend to be more formalized.

Similarly to SIC code 31, Standardization showed a negatively directed relationship with the Operating Environment. So a stable environment seems to encourage opportunities to standardize controls and procedures. It was interesting that Formalization is positively related to the amount of environmental change; perhaps hinting that differing control strategies also applied to the Textile, Clothing and Leather industries.

Configuration : The important predictors for the Configuration variables were all combinations of Organization Size, Environment and Dependence :

- a broader CEO span is predicted by greater size and more dependence on the single biggest customer;
- a higher ratio of first line subordinates is associated with greater size, and a more predictable environment;
- more organization depth is predicted by lack of dependence on an owning group or company;
- an increase in the ratio of managers is linked to a more dynamic environment and less dependence on an owning group or company; and finally,
- a higher ratio of clerical workers is predicted by less dependence on the largest supplier, and more turbulence in the operating environment.

Centralization : Centralization of Policy Decisions was predicted by Power Control and Organization Size. The Power Control relationship was negatively directed. So the more politically driven and the smaller the organizations in this group, the more policy decisions were centralized. Looking at First Line Discretion, there were two predictors, Age and Environmental Change, and both were negative. This situation is analogous to the development sequence reported by Kim and Utterback (1983) which was described earlier in this chapter,

i.e. young organizations in developing countries tend to function in a more stable environment and to have mechanistic, centralized controls.

Organicity : There was only one independent variable with significance for predicting Organicity - the Operating Environment. The relationship was positive, and so the more turbulent the operating environment, the more the organization structures will tend toward organic structures. So the 'classical' linkage between environment and organic structures prevails among manufacturing organizations in the Textile, Clothing and Leather industry.

4.3. SIC code 33 : Wood and Wood Products.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization		No significant correlations at the 0.05 level			
Formalization					
Organization Size	0.5826	0.5826	0.3395	9.250	0.0070
Workflow Integration	0.4388	0.7435	0.5528	10.508	0.0011
Standardization					
Operating Environment	−0.5094	0.5094	0.2595	6.308	0.0218
Executive Span		No significant correlations at the 0.05 level			
Subordinate Ratio		No significant correlations at the 0.05 level			
Organization Depth					
Workflow Integration	0.4817	0.4817	0.2320	5.439	0.0315
Management Ratio					
Workflow Integration	0.4562	0.4562	0.2081	4.731	0.0432
Indirect Worker ratio		No significant correlations at the 0.05 level			
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy		No significant correlations at the 0.05 level			
Policy Decision Level					
Process Technology	−0.5059	0.5059	0.2560	6.192	0.0228
First line discretion					
Power Control	0.5334	0.5334	0.2848	7.156	0.0154
Organicity		No significant correlations at the 0.05 level			

Figure 8.14. Stepwise Multiple Regression : SIC code 33 (N = 20)

The organizations in SIC code 33 are concerned with the manufacture and processing of wood and wood products. There were 20 of them altogether. Examination of figure 8.14 on the previous page shows that seven, or half, of the dependent variables did not elicit a significant correlation at the 0,05 level. All of the other seven that did show significant relationships exhibited multiple R's and R^2's that were generally stronger than the relationships in most of the other SIC codes.

Structuring of Activities : Formalization was positively related to both Organization size and Workflow Integration, and Standardization was negatively related to the Operating Environment. So the larger the organizations in this group and the more automated their production machinery, the more formalized they were. A more tranquil operating environment was reflected in a higher degree of standardization of controls and procedures.

Configuration : The only Configuration variables to throw up any kind of linkage with the independent variables were Organization Depth and the Management Ratio. Both showed positive relationships with Workflow Integration. So the more automated this group's technology, the more layers the organizations were comprised of, and the greater the number of their managers.

Centralization : The centralization of Policy Decisions was also related to technology, but this time it was negatively linked to Process Technology. So the less continuous and flexible the production throughput, the more these organizations centralized their policy decisions. One is left wondering if this relationship might be peculiar to the lumber industry, as was discussed earlier, in that a fair amount of the production machinery is mobile and flexible in the cutting, harvesting and collection phase, while the milling and sawing phase consists of static machining processes with fixed units of throughput.

The centralization of first line discretionary decisions was quite strongly linked to Power Control, indicating that the politically driven organizations in this sector were more prone to limiting the discretion of their first line supervisors.

4.4. SIC code 34 : Paper, Paper Products, Printing and Publishing

There were 40 organizations in the section that made up the Paper, Paper Products, Printing and Publishing industries and the signific-

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Unpredictable Environment	−0.4645	0.4645	0.2158	10.456	0.0025
Formalization					
Supplier Dependence	−0.3506	0.3506	0.1230	5.327	0.0265
Organization Size	0.2942	0.4677	0.2188	5.182	0.0104
Standardization					
Internal Dependence	0.4253	0.4253	0.1809	8.392	0.0062
Operating Environment	−0.1996	0.5488	0.3012	7.975	0.0013
Executive Span					
Internal Dependence	−0.4898	0.4898	0.2399	11.996	0.0013
Subordinate Ratio					
Supplier Dependence	0.4296	0.4296	0.1845	8.600	0.0057
Organization Depth					
Unpredictable Environment	−0.3433	0.3433	0.1178	5.076	0.0301
Management Ratio					
Workflow Integration	0.3560	0.3560	0.1267	5.515	0.0242
Organization Size	−0.2336	0.4727	0.2235	5.323	0.0093
Indirect Worker ratio					
Environmental Change	0.3991	0.3991	0.1593	7.200	0.0107
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy					
Internal Dependence	−0.3851	0.3851	0.1483	6.618	0.0141
Policy Decision Level					
Internal Dependence	0.4549	0.4549	0.2069	9.915	0.0032
Unpredictable Environment	−0.3671	0.5550	0.3080	8.233	0.0011
Workflow Integration	−0.3724	0.6227	0.3878	7.600	0.0005
First line discretion					
Workflow Integration	−0.3376	0.3376	0.1140	4.887	0.0332
Organicity					
Workflow Integration	0.3467	0.3467	0.1201	5.190	0.0284

Figure 8.15. Stepwise Multiple Regression : SIC code 34 (N = 40)

ant predictive relationships are set out in figure 8.15. Only one regression equation, that of the Clerical Worker Ratio, failed to throw up a significant relationship between independent and dependent variables.

Structuring of Activities : In this SIC group Specialization showed a tendency to increase when the environment was predictable. Formalization showed an inclination to be more prevalent when organizations where less dependent on their largest supplier, and more prevalent as the organization's size increased. Standardization increased when Internal Dependence increased and also increased when environmental turbulence decreased.

Configuration : The multiple regression of the Configuration variables revealed a broad range of relationships :

- The less the organizations in this group were dependent on a parent company or owning group, the broader was the CEO's span of control.
- More dependence on a single supplier was tied to an increased ratio of first line subordinates.
- Organization Depth was negatively related to environmental unpredictability, so a more predictable environment was linked to greater organization depth.
- The Management Ratio was positively related to Workflow Integration and negatively related to Organization Size. So more automated machinery was linked to more managers, and smaller size was also linked to more managers. This finding is puzzling and, perhaps, is an indication of direct workers being replaced by more sophisticated technology. This could result in downsizing and an apparent increase in the ratio of managers.
- Finally, the ratio of indirect workers was related to the environment in that the more environmental change there was, the larger the ratio of indirect workers. Again, the reasons for this situation are not immediately apparent. Perhaps companies in the Paper, Printing and Publishing industry cope with environmental

uncertainty by increasing their numbers of support staff. But then why does organization depth as well as the number of specialists *decrease* with increased environmental unpredictability? Maybe the answer lies in the fact that unpredictability and change measure different aspects of environmental uncertainty.

Centralization : Autonomy showed the negative relationship with Internal Dependence that was to become familiar in many of the other groups that were analysed. Centralization of Policy decisions was tied to three independent variables: Internal Dependence, Environmental Unpredictability, and Workflow Integration. The latter two relationships were negatively directed. So the more dependent on a holding group or owning company, the more policy decisions were centralized; and the more predictable the environment and the less automated the technology, the more policy decisions were centralized. Looking at the converse of these relationships makes them a bit more clear : an unpredictable environment, sophisticated technology, and lack of dependence on a holding group are associated with decentralization.

Organicity : Organicity was also predicted by Workflow Integration, although this time the relationship was positively directed. In other words, more automated technology in the Paper, Printing and Publishing industries was associated with structures that are more organic.

4.5. SIC code 35 : Chemicals, Petroleum, Rubber & Plastic Products.

There were 68 organizations in the group comprising Chemicals, Petroleum, Rubber and Plastic Products. It will be seen from figure 8.16 overleaf that three of the dependent variables did not produce a significant correlation at the default level of analysis.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.3506	0.3506	0.1229	9.250	0.0034
Formalization					
Internal Dependence	0.3581	0.3581	0.1283	9.709	0.0027
Organization Size	0.3371	0.4980	0.2480	10.718	0.0001
Environmental Change	0.3418	0.5598	0.3133	9.734	0.0000
Supplier Dependence	−0.2946	0.5999	0.3599	8.858	0.0000
Standardization					
Environmental Change	−0.3764	0.3764	0.1417	10.892	0.0016
Internal Dependence	−0.2668	0.4546	0.2067	8.468	0.0005
Executive Span					
Organization Size	0.3319	0.3319	0.1102	8.173	0.0057
Organization Age	0.2611	0.4298	0.1847	7.363	0.0013
Subordinate Ratio					
Internal Dependence	−0.2655	0.2655	0.0705	5.005	0.0287
Unpredictable Environment	−0.2569	0.3610	0.1303	4.870	0.0107
Organization Depth		No significant correlations at the 0.05 level			
Management Ratio					
Supplier Dependence	−0.2965	0.2965	0.0879	6.359	0.0141
Indirect Worker ratio		No significant correlations at the 0.05 level			
Clerical worker ratio					
Supplier Dependence	−0.3253	0.3253	0.1058	7.810	0.0068
Autonomy					
Internal Dependence	−0.3527	0.3527	0.1244	9.377	0.0032
Policy Decision Level					
Environmental Change	−0.3084	0.3084	0.0951	6.935	0.0105
Workflow Integration	−0.2583	0.3906	0.1526	5.851	0.0046
First line discretion		No significant correlations at the 0.05 level			
Organicity					
Supplier Dependence	0.3406	0.3406	0.1160	8.662	0.0045
Environmental Change	0.3192	0.4834	0.2337	9.911	0.0002
Customer Dependence	−0.1221	0.5392	0.2907	8.742	0.0001

Figure 8.16. Stepwise Multiple Regression : SIC code 35 (N = 68)

Structuring of Activities : Organization size was the only predictor of specialization, which means that as organizations in this group grow larger they acquire more specializations. Formalization was linked to four independent variables : Internal Dependence, Organization Size, Environmental Change, and Supplier Dependence. The last relationship was negatively directed. So organizations in this group that are : (i) larger in size, (ii) more dependent on a holding company or group, (iii) functioning in an environment that is

characterized by constant change, and (iv) less dependence on a single supplier, tend to have more formalized structures.

Finally, Standardization showed a negatively directed relationship with both Environmental Change and Internal Dependence. So the less the dependence on an owning company or group and the more predictable the environment, the more standardized were the companies in this group.

Configuration : Four of the six independent variables identified with the Configuration Variables showed negatively directed relationships. The two positive relationships were both with the CEO's span of control.

- The larger and the older the organization the greater the CEO's span of control.
- Less dependence on a holding company or owning group and a more predictable environment were linked to a higher ratio of first line subordinates.
- Both the Management Ratio and the Clerical Worker Ratio were negatively tied to the degree of dependence on the organization's largest single supplier. So the less dependent organizations were on a single supplier, the more managers and clerks they tended to have. No doubt the higher numbers of clerks and managers would be partly associated with a more complex procurement procedure.

Centralization : Internal Dependence, Environment and Technology were the main influences on centralization. The less dependent organizations were on their owning group, the more autonomous they were in terms of overall centralization. In terms of Policy Decision, fewer environmental changes and less automated operations technology were reflected in more centralization. So a placid environment and simple technology seem to create conditions in which centralized control can take place.

Organicity : There were three predictors of Organicity. Apart from the normal positive relationship with environmental change or

turbulence, there was also a connection with both Supplier Dependence and Customer Dependence. The latter was negatively directed. So less dependence on a single customer and more dependence on a single supplier encouraged the formation of organic structures. This situation is possibly best understood in the context of the strategic nature of petroleum and petroleum products during the sanctions years and the many years of government intrusion into the supply and distribution of these strategic materials. Significantly, even though the raw scores of Supplier Dependence were only average for the Chemicals, Petroleum, Rubber and Plastic Products group overall, this independent variable features more often as a predictor of the dependent structural variables in this SIC group than in any of the others.

4.6. SIC code 36 : Non-metallic Mineral Products.

The category of non-metallic mineral products includes industries such as pottery, china, glass, clay, bricks, cement, plaster, stone, and fibre glass products. It consisted of 29 organizations and five of the dependent variables yielded no significant predictors when they were subjected to a multiple regression analysis. Generally, the multiple R's and R^2's were high, probably because there was a fair similarity in the type of industry but a reasonable spread of difference in the values of the Independent variables. The main predictors are shown in Figure 8.17 overleaf.

Structuring of Activities : As in the previous SIC group, Organization Size was the only predictor of Specialization, but the relationship was much stronger at R = 0,65. So larger organizations in this group are confidently expected to exhibit far more specialization. Formalization showed the familiar linkages with Internal Dependence and Organization Size. Bigger organizations and organizations that were dependent on their owning group or company tend to have more formalized systems. Additionally there was an interesting and strong negatively directed relationship with Power Control. So the less politically driven organizations in this group relied more

on formalization as a higher order control strategy. Finally, looking at Standardization, the by-now-familiar negative link with Environmental Change was present - indicating that standardization tends to flourish in a more stable environment. In addition, there

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.6547	0.6547	0.4287	20.259	0.0001
Formalization					
Power Control	−0.6125	0.6125	0.3751	16.209	0.0004
Internal Dependence	0.5827	0.6881	0.4745	11.736	0.0002
Organization Size	0.5298	0.7629	0.5821	11.606	0.0001
Standardization					
Environmental Change	−0.4636	0.4636	0.2149	7.390	0.0113
Organization Lifecycle	0.1742	0.5982	0.3578	7.2449	0.0032
Executive Span		No significant correlations at the 0.05 level			
Subordinate Ratio					
Power Control	0.5322	0.5322	0.2832	10.668	0.0030
Organization Depth					
Organization Size	0.5729	0.5729	0.3283	13.193	0.0012
Management Ratio		No significant correlations at the 0.05 level			
Indirect Worker ratio					
Internal Dependence	−0.5076	0.5076	0.2576	9.369	0.0049
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy		No significant correlations at the 0.05 level			
Policy Decision Level					
Internal Dependence	−0.4141	0.4141	0.1714	5.587	0.0256
Supplier Dependence	−0.3063	0.5364	0.2877	5.251	0.0121
First line discretion		No significant correlations at the 0.05 level			
Organicity					
Organization Size	−0.4401	0.4401	0.1937	6.484	0.0169
Process Technology	−0.3324	0.5743	0.3298	6.398	0.0055

Figure 8.17. Stepwise Multiple Regression : SIC code 36 (N = 29)

was a link with the organization's life cycle stage in that more mature organizations were inclined exercise more standardization.

Configuration : Only three independent variables were present in

the entire spread of Configuration variables :

- the greater the amount of Power Control the more first line subordinates there are,
- the larger the organization's size the more layers it had, and
- the less dependent on a holding group or owning company the higher was the ratio of indirect workers.

In summary, a larger, more politically driven organization which is independent of its owning group will have more depth, and more first line subordinates and indirect workers. It appears that pressure to downsize or shed staff in this SIC group comes from Head Office, and in the absence of this pressure, empires are inclined to increase and prosper.

Centralization : Only the Policy Decision variable showed up any significant relationships, with two predictors. Both were negatively directed. This means that the less dependent a company is on both its holding group or company and its largest supplier, the more policy decisions are centralized. So lack of dependence in general seems to be the incentive to centralize among companies in the non-metallic mineral products group.

Organicity : The multiple regression equation for Organicity revealed two predictors, both of which were negatively directed. In short, smaller size and more discontinuous and flexible process technology were associated with structures that were more organic.

4.7. SIC code 37 : Ferrous and Non-ferrous Metal Basic Industries.

This group consisted of just 18 organizations and, as will be seen in figure 8.18 overleaf, seven of the multiple regression equations yielded no significant predictor variables at the default level of 0,05. The relationships that did arise exhibited correlations that were generally very high. Again, this was probably a function of the overall homogeneity of the type of industry in the group and the

heterogeneity of the individual organizations with respect to the independent variables.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.7544	0.7544	0.5691	21.133	0.0003
Process Technology	0.5101	0.9033	0.8159	33.233	0.0000
Customer Dependence	0.1191	0.9383	0.8805	34.393	0.0000
Formalization		No significant correlations at the 0.05 level			
Standardization					
Organization Size	−0.4850	0.4850	0.2352	4.921	0.0413
Executive Span		No significant correlations at the 0.05 level			
Subordinate Ratio		No significant correlations at the 0.05 level			
Organization Depth					
Supplier Dependence	−0.4720	0.4720	0.2228	4.587	0.0480
Organization age	−0.4365	0.6501	0.4227	5.491	0.0162
Management Ratio		No significant correlations at the 0.05 level			
Indirect Worker ratio		No significant correlations at the 0.05 level			
Clerical worker ratio					
Customer Dependence	−0.5337	0.5337	0.2848	6.372	0.0225
Autonomy					
Customer Dependence	0.4809	0.4809	0.2313	4.814	0.0433
Policy Decision Level		No significant correlations at the 0.05 level			
First line discretion		No significant correlations at the 0.05 level			
Organicity					
Process Technology	−0.4849	0.4849	0.2351	4.919	0.0414

Figure 8.18. Stepwise Multiple Regression : SIC code 37 (N =18)

Structuring of Activities : Organization Size, Process Technology, and Customer Dependence were the main predictors of Specialization, yielding a very high multiple correlation of 0,94 which explained more than 88% of the variance. Size and Technology accounted for by far the majority of this statistic. So the larger the organizations that comprised this group and the more continuous their production throughput, the more specializations there were in the organizations.

Dependence on an owning group or company also exercised some influence on the amount of specialization. Looking at Standardization, only size was related, negatively, to the amount of standardization. So smaller organizations tended to make more use of standardization as a means of control. The complete lack of Formalization as a control strategy is possibly explained by the very high correlations on the Specialization variable. It will be remembered that the Ferrous and Non-ferrous Metal Basic Industries group also scored highest on Organicity. One of the main sources of influence and control in organic structures is expertise, rather than the more traditional and hierarchical regulatory and authority mechanisms. Implicit in a high degree of expertise or specialization is the 'bought-in' formalization that comes with formal qualifications and expertise in a particular discipline.

Configuration : There were only three significant correlations among the Configuration variables and they were confined to just two of the dependent variables - Organization Depth and the Clerical Worker Ratio. All of the relationships were negatively directed :

- The less dependent an organization in this group was on its biggest single supplier and the younger it was, the more layers it had in its physical design.
- The less dependent it was on its largest single customer, the more clerical workers it had.

Both of these relationships are perplexing - all the more so because they are quite strong and have a high level of significance. Clearly, this is another area that could do with further study and investigation. Two possible explanations are suggested by looking at the converse of these relationships :

(i) With respect to Organization Depth, a high degree of supplier dependence, or backward integration, may mean that an organization has achieved a degree of strategic symbiosis with its key supplier which allows it to structure itself into a more simple configuration; thus allowing it to dispense with extraneous layers of

authority. So the more dependent an organization is on its largest supplier, the shallower its structure will be. To achieve this state would take time and hence the negative relationship with Organization Age.

(ii) Regarding the Clerical Worker Ratio, a similar situation could arise, except that the dependence is now in the direction of the largest customer, i.e. forward integration. This would result in a more secure market and guaranteed channels of distribution. The stability flowing from this situation would result in less need for support personnel such as clerks.

Significantly, the environment does not figure as a predictor in any of the regression equations, even though the raw scores for all three of the environmental measures were on, or above, the average for the total sample. All of this appears to indicate that, at a macro level of analysis, the Basic Metal Industries group may have achieved a large measure of control of the crucial contingencies in the industry's domain. This situation is very reminiscent of Astley and Graham's (1983) collective action view of organization functioning which was described on pages 106 to 108 of this study.

Centralization : Only one of the Centralization variables, that of Autonomy, showed a significant relationship. The predictor variable was dependence on the organization's largest customer. So the more dependent an organization was on its largest customer, the more autonomous it was. Again, this is a possible pointer to the synergy that exists between organizations in the Basic Metal Industries and their major customers. Organizations derive strength and autonomy from sound, symbiotic relationships.

Organicity : Organicity showed a negatively directed relationship with Process Technology, indicating that more discontinuous and flexible production throughput was linked to organic structures. The nature of Basic Metal Industries is such that organizations would tend toward custom or batch process technology rather than mass production or continuous process technology. And this tendency toward flexibility and discontinuity is reflected in these organizations'

tendency toward more organic, rather than mechanistic, structures.

4.8. SIC code 38 : Fabricated Metal Products, Machinery and Equipment, and Electrical Machinery, Apparatus, Appliances and Supplies.

The final SIC code is also the largest, consisting of 123 organizations. All of the multiple regression equations that were conducted for the dependent variables yielded significant predictors. These are illustrated in figure 8.19 overleaf.

Structuring of Activities : Specialization was related to both size and dependence. These were fairly common relationships in all of the SIC groups - greater size and more dependence on a holding group or company was reflected in more specialization within the organization. Formalization presented similar relationships with these two independent variables and, in addition, there was a positive relationship between the degree of formalization and the Operating Environment. So organizations in this group also seemed to cope with environmental turbulence by increasing the formalization of their structures and procedures. Finally, Standardization showed the familiar negative link with the operating environment, as well as a negative link with age. So the less turbulent the environment and the younger the organizations in this group, the more they tend to standardize their activities. Again, the similarity to the reverse developmental cycle in developing countries that was postulated by Kim Utterback (1983) is apparent.

Configuration : All of the configuration variables displayed a wide variety of relationships :

- The larger the organization and the less continuous its production throughput, the broader the CEO's band of direct reports.
- The larger the organization, the more first line subordinates it has.
- The larger the organization and the more continuous its production throughput and the less the amount of environmental change, the

greater will be the organization's depth.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.5035	0.5035	0.2535	41.098	0.0000
Internal Dependence	0.2912	0.5545	0.3075	26.644	0.0000
Formalization					
Organization Size	0.3261	0.3261	0.1063	14.396	0.0002
Internal Dependence	0.3091	0.4245	0.1802	13.191	0.0000
Operating Environment	0.2488	0.4610	0.2209	11.245	0.0000
Standardization					
Operating Environment	−0.2949	0.2949	0.0870	11.524	0.0009
Organization Age	−0.2589	0.3858	0.1488	10.490	0.0001
Executive Span					
Organization Size	0.2527	0.2527	0.0639	8.255	0.0048
Process Technology	−0.1296	0.3143	0.0988	6.578	0.0019
Subordinate Ratio					
Organization Size	0.2242	0.2242	0.0503	6.403	0.0127
Organization Depth					
Organization Size	0.3786	0.3786	0.1434	20.249	0.0000
Process Technology	0.2807	0.4309	0.1857	13.683	0.0000
Environmental Change	−0.1719	0.4891	0.2392	12.469	0.0000
Management Ratio					
Organization Age	0.2565	0.2565	0.0658	8.524	0.0042
Supplier Dependence	−0.1837	0.3374	0.1138	7.708	0.0007
Indirect Worker ratio					
Supplier Dependence	0.2636	0.2636	0.0695	9.037	0.0032
Environmental Change	−0.2157	0.3320	0.1102	7.432	0.0009
Clerical worker ratio					
Workflow Integration	0.1881	0.1881	0.0354	4.441	0.0372
Process Technology	−0.1797	0.3270	0.1069	7.184	0.0011
Internal Dependence	0.1490	0.3715	0.1380	6.349	0.0005
Autonomy					
Internal Dependence	−0.3093	0.3093	0.0957	12.799	0.0005
Supplier Dependence	−0.2837	0.4031	0.1625	11.639	0.0000
Policy Decision Level					
Organization Size	−0.2719	0.2719	0.0739	9.659	0.0023
Power Control	0.2587	0.3627	0.1315	9.086	0.0002
First line discretion					
Power Control	0.1994	0.1994	0.0398	5.009	0.0270
Organicity					
Power Control	−0.2646	0.2646	0.0700	9.108	0.0031
Internal Dependence	−0.2505	0.3713	0.1379	9.593	0.0001
Organization Size	−0.2161	0.4247	0.1804	8.729	0.0000

Figure 8.19. Stepwise Multiple Regression : SIC code 38 (N =123)

- The older the organization and the less dependent it is on its biggest supplier, the more managers it will have.
- The more dependent the organization is on its biggest supplier and

the less environmental change it is subject to, the larger will be the ratio of its indirect workers.

- The more automated the technology and the less continuous the units of throughput and the more dependent the organization is on its owning group or company, the larger will be the number of its clerical workers.

The import of some of the above relationships is also somewhat obscure and not always readily apparent. Again, it is an area that would definitely benefit from further study.

Centralization : An organization's degree of autonomy in this SIC group was linked to both Internal Dependence and Supplier dependence. Both relationships were negatively directed. This meant that the less dependent on its owning group and the less dependent on its biggest supplier, the more autonomous was an organization in this group. In terms of policy decisions, a negative relationship with size and a positive relationship with Power Control were revealed - so organizations that centralized their policy decisions tended to be smaller and more politically driven. Finally, first line discretion was also linked to Power Control, so the more political the organization, the less discretion was passed down to the first line supervisor.

Organicity : Organicity was characterized by three negatively directed relationships with Power Control, Internal Dependence, and Organization Size. So organic structures were predicted by less political activity, less dependence on the organization's holding group, and, finally, smaller organization size. All of these relationships are generally consistent with the accepted wisdom and with everything that has been said about organic and mechanistic structures. The addition of a turbulent or changing environment would complete the picture of classical organic structures.

The above section concludes the overview of the manufacturing sector split into its various constituent, SIC-coded parts. Each of the SIC codes is worthy, in its own right, of a review similar in scope to

this entire study. So the treatment given here has of necessity been quite superficial or even cursory. This section of the study is concluded below by a brief look at the effects of combining a number of SIC codes into four groups. No specific criteria were used to lump them together, except that they were the most interesting of all the combinations that were tried and, logically, they seemed to fit together and are often associated.

4.9. SIC codes 33 and 34 : Wood, Pulp, Paper, and Publishing.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Unpredictable Environment	−0.3110	0.3110	0.0968	6.213	0.0156
Formalization					
Organization Size	0.3865	0.3865	0.1494	10.185	0.0023
Internal Dependence	0.2837	0.4539	0.2060	7.396	0.0014
Supplier Dependence	−0.2476	0.5136	0.2638	6.688	0.0006
Standardization					
Operating Environment	−0.3082	0.3082	0.0950	6.088	0.0166
Executive Span					
Workflow Integration	0.3286	0.3286	0.1080	7.022	0.0104
Environmental Change	0.2934	0.4428	0.1961	6.952	0.0020
Subordinate Ratio					
Supplier Dependence	0.3398	0.3398	0.1155	7.572	0.0079
Workflow Integration	−0.3275	0.4498	0.2024	7.230	0.0016
Organization Depth					
Customer Dependence	0.2718	0.2718	0.0739	4.626	0.0357
Management Ratio					
Workflow Integration	0.4073	0.4073	0.1659	11.534	0.0012
Indirect Worker ratio					
Environmental Change	0.2619	0.2619	0.0686	4.272	0.0432
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy					
Power Control	−0.3162	0.3162	0.0999	6.441	0.0139
Policy Decision Level					
Workflow Integration	−0.4464	0.4464	0.1993	14.431	0.0004
First line discretion					
Power Control	0.3730	0.3730	0.1392	9.375	0.0033
Organicity					
Power Control	−0.2738	0.2738	0.0750	4.699	0.0343

Figure 8.20. Stepwise Multiple Regression : SIC codes 33 and 34. (N = 60)

The first combined group consisted of SIC codes 33 and 34 and was designated Wood, Pulp, Paper and Publishing. The areas of activity carried out by the 60 organizations that comprise this group are fairly diverse and the main predictors are shown in figure 8.20.

There were no significant correlations for the Configuration variable of the Clerical Worker Ratio. Independent variables that became significant as a result of combining the two SIC codes into one group were :

- Internal Dependence as a predictor for Formalization;
- Workflow Integration and Environmental Change as predictors for the CEO's span of control;
- Workflow Integration as a predictor for the Subordinate Ratio;
- Customer Dependence as a predictor for Organization Depth;
- Power Control as a predictor for Autonomy; and, finally,
- Power Control as a predictor for Organicity.

Independent variables that were discarded as predictors by the step-wise regression analysis after the two SIC groups were combined were:

- Workflow Integration for Formalization;
- Internal dependence for Standardization;
- Internal dependence for the CEO's span of Control;
- Unpredictable Environment and Workflow Integration for Organization Depth;
- Organization Size for the Management Ratio;
- Internal dependence for Autonomy;
- Process Technology, Internal dependence, and Unpredictable Environment for Policy Decision centralization;
- Workflow Integration for First Line Discretion; and, finally,
- Workflow Integration for Organicity.

Completely new causal variables were disclosed in the larger, combined group for the dependent variables of CEO's Span of Control, Organization Depth, Autonomy, and Organicity.

4.10. SIC codes 36 and 37 : Primary Materials Manufacturing.

The second combined group was an amalgam of SIC codes 36 and 37 and was labelled Primary Materials Manufacturing. The key predictive relationships are shown in figure 8.21.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.6692	0.6692	0.4477	36.488	0.0000
Organization Life Cycle	0.2275	0.7078	0.5010	22.089	0.0000
Formalization					
Organization Size	0.4974	0.4974	0.2474	14.794	0.0004
Internal Dependence	0.4927	0.6678	0.4460	17.709	0.0000
Standardization					
Environmental Change	−0.3521	0.3521	0.1239	6.638	0.0152
Executive Span		No significant correlations at the 0.05 level			
Subordinate Ratio					
Power Control	0.3911	0.3911	0.1529	8.127	0.0066
Organization Depth					
Organization Size	0.3699	0.3699	0.1368	7.131	0.0105
Customer Dependence	0.2990	0.5102	0.2603	7.741	0.0013
Environmental Change	−0.2341	0.5869	0.3445	7.533	0.0004
Internal Dependence	0.1896	0.6359	0.4044	7.129	0.0002
Management Ratio					
Organization Life Cycle	0.2912	0.2912	0.0848	4.169	0.0470
Indirect Worker ratio					
Internal Dependence	−0.3129	0.3129	0.0979	4.885	0.0322
Clerical worker ratio		No significant correlations at the 0.05 level			
Autonomy		No significant correlations at the 0.05 level			
Policy Decision Level					
Environmental Change	−0.3990	0.3990	0.1592	8.519	0.0055
Organization Size	−0.3083	0.5025	0.2525	7.433	0.0017
First line discretion		No significant correlations at the 0.05 level			
Organicity					
Process Technology	−0.4088	0.4088	0.1671	9.027	0.0043

Figure 8.21. Stepwise Multiple Regression : SIC codes 36 and 37 (N = 47)

The combination of the heavy manufacturing, or 'smokestack', industries in these two groups resulted in a larger batch of 47 organiza-

tions. The independent variables that became significant as a result of the combination of SIC codes 36 and 37 were :

- Life-cycle stage as a predictor for Specialization;
- Customer Dependence, Environmental Change, and Internal Dependence as predictors for Organization Depth;
- Life-cycle stage as a predictor for the Management Ratio; and,
- Environmental Change and Organization Size as predictors for Policy Decision centralization.

A number of independent variables were dropped as predictors after the stepwise multiple regression analysis of the combined SIC groups. These were :

- Process Technology and Customer Dependence for Specialization;
- Power Control for Formalization;
- Organization Size and Environmental Change for Standardization;
- Supplier Dependence and Organization Age for Organization Depth;
- Customer Dependence for Clerical Worker Ratio;
- Customer Dependence for Autonomy;
- Internal Dependence and Supplier Dependence for Policy Decision centralization; and, finally,
- Organization Size for Organicity.

Completely new causal variables or combinations of causal variables were found for the Configuration variable of the Management Ratio, as well as for the Policy Decision centralization variable.

4.11. SIC codes 37 and 38 : Metals, Machinery and Engineering

The combination of SIC codes 37 and 38 also resulted in a group of 'smokestack' industries, but excluded all non-metal manufacturing organizations. The total number of organizations in this merged

group was 141 and the major predictors are shown in figure 8.22.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.5256	0.5256	0.2762	53.044	0.0000
Internal Dependence	0.2923	0.5741	0.3295	33.913	0.0000
Formalization					
Organization Size	0.3277	0.3277	0.1074	16.721	0.0001
Internal Dependence	0.3004	0.4202	0.1765	14.793	0.0000
Operating Environment	0.2263	0.4545	0.2066	11.891	0.0000
Standardization					
Organization age	−0.2507	0.2507	0.0629	9.325	0.0027
Operating Environment	−0.2360	0.3413	0.1165	9.098	0.0002
Executive Span					
Organization Size	0.2708	0.2708	0.0733	10.999	0.0012
Subordinate Ratio					
Organization Size	0.2088	0.2088	0.0436	6.339	0.0129
Organization Depth					
Organization Size	0.3099	0.3099	0.0960	14.767	0.0002
Process Technology	0.2872	0.3881	0.1506	12.233	0.0000
Environmental Change	−0.1824	0.4587	0.2104	12.171	0.0000
Management Ratio					
Organization age	0.2099	0.2099	0.0441	6.406	0.0125
Supplier Dependence	−0.1876	0.2979	0.0888	6.720	0.0016
Indirect Worker ratio					
Supplier Dependence	0.2116	0.2116	0.0448	6.517	0.0118
Clerical worker ratio					
Process Technology	−0.1814	0.1814	0.0329	4.729	0.0313
Workflow Integration	0.1292	0.2816	0.0791	5.922	0.0034
Internal Dependence	0.1359	0.3295	0.1086	5.562	0.0012
Autonomy					
Internal Dependence	−0.2959	0.2959	0.0876	13.341	0.0004
Supplier Dependence	−0.2953	0.4033	0.1627	13.404	0.0000
Process Technology	0.0744	0.4331	0.1876	10.542	0.0000
Policy Decision Level					
Organize Size	−0.2647	0.2647	0.0700	10.469	0.0015
Power Control	0.2551	0.3500	0.1225	9.635	0.0001
Internal Dependence	−0.2059	0.3883	0.1508	8.106	0.0001
First line discretion					
Power Control	0.1988	0.1988	0.0395	5.717	0.0181
Organicity					
Internal Dependence	−0.2626	0.2626	0.0690	10.297	0.0017
Power Control	−0.2161	0.3479	0.1210	9.499	0.0001
Customer Dependence	−0.1878	0.3824	0.1462	7.822	0.0001
Organize Size	−0.1565	0.4174	0.1742	7.172	0.0000

Figure 8.22. Stepwise Multiple Regression : SIC codes 37 and 38 (N =141)

There were three independent variables that became significant as a result of the combination of these two SIC codes. They were:

- Process Technology as a predictor for Autonomy;

- Internal Dependence as a predictor for Policy Decision centralization, and
- Customer Dependence as a predictor for Organicity.

Seven independent variables were terminated as predictors after the stepwise multiple regression analysis of the combined SIC groups. These were :

- Process Technology and Customer Dependence for Specialization;
- Process Technology for the CEO's Span of Control;
- Supplier Dependence and Organization Age for Organization Depth;
- Environmental Change for the Indirect Worker Ratio;
- Process Technology and Customer Dependence for the Clerical Worker Ratio;
- Customer Dependence for Autonomy; and, finally,
- Process Technology for Organicity.

The disparity in size between these two SIC groups was quite considerable: 123 organizations for SIC code 38 versus only 18 for SIC code 37. It seems that many of the predictors for the smaller group were simply swallowed in the larger analysis and no major emergence of completely new causal variable combinations emerged.

4.12. SIC codes 36 to 38 : Metallic & Non-metallic Materials, and Machinery.

The final SIC combination was that of all the large 'smokestack' industries - both metal and non-metal. The total number of organizations now grew to 170 and the main predictors are illustrated in figure 8.23 overleaf. The Configuration variable of the Subordinate Ratio, which had produced a predictor variable when just SIC codes 37 and 38 were combined, now showed no significant correlations at the default level of significance. This was despite the fact that, before its

addition to this group, SIC code 36 did have a predictor for the Subordinate Ratio dependent variable when it was analysed on its own.

Dependent variables Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level
Functional Specialization					
Organization Size	0.5387	0.5387	0.2902	68.697	0.0000
Internal Dependence	0.2760	0.5803	0.3367	42.392	0.0000
Formalization					
Organization Size	0.3676	0.3676	0.1351	26.245	0.0000
Internal Dependence	0.3496	0.4805	0.2309	25.066	0.0000
Workflow Integration	0.2918	0.5083	0.2583	19.274	0.0000
Operating Environment	0.2714	0.5297	0.2806	16.093	0.0000
Standardization					
Organization Age	−0.2172	0.2172	0.0472	8.317	0.0044
Operating Environment	−0.1959	0.2980	0.0888	8.138	0.0004
Executive Span					
Organization Size	0.2581	0.2581	0.0666	11.989	0.0007
Subordinate Ratio		No significant correlations at the 0.05 level			
Organization Depth					
Organization Size	0.3699	0.3699	0.1367	26.612	0.0000
Environmental Change	−0.1904	0.4268	0.1822	18.602	0.0000
Process Technology	0.2089	0.4686	0.2195	15.565	0.0000
Customer Dependence	0.0849	0.4879	0.2381	12.890	0.0000
Management Ratio					
Environmental Change	0.1650	0.1650	0.0272	4.702	0.0315
Indirect Worker ratio					
Operating Environment	−0.1763	0.1763	0.0311	5.391	0.0214
Clerical worker ratio					
Process Technology	−0.1763	0.1763	0.0311	5.391	0.0214
Workflow Integration	0.1102	0.2542	0.0646	5.767	0.0038
Autonomy					
Internal Dependence	−0.2673	0.2673	0.0715	12.931	0.0004
Supplier Dependence	−0.2148	0.3339	0.1115	10.481	0.0001
Policy Decision Level					
Organization Size	−0.2809	0.2809	0.0789	14.395	0.0002
Environmental Change	−0.2561	0.3692	0.1363	13.175	0.0000
Internal Dependence	−0.2556	0.4171	0.1740	11.684	0.0000
First line discretion					
Power Control	0.1637	0.1638	0.0268	4.630	0.0328
Organicity					
Process Technology	−0.2278	0.2278	0.0519	9.199	0.0028
Organization Size	−0.2028	0.2854	0.0815	7.406	0.0008
Power Control	−0.1488	0.3362	0.1130	7.052	0.0002
Internal Dependence	−0.2040	0.3770	0.1421	6.834	0.0000

Figure 8.23. Stepwise Multiple Regression : SIC codes 36 to 38 (N = 170)

After the three groups were combined, five independent variables became significant. These were :

- Workflow Integration as a predictor for Formalization;
- Customer Dependence as a predictor for Organization Depth;
- Environmental Change as a predictor for the Management Ratio;
- Operating Environment as a predictor for the Indirect Worker Ratio; and,
- Environmental Change as a predictor for Policy Decision centralization.

The addition of SIC code 36 to the group of SIC codes 37 and 38 resulted in a startling *twelve* predictor variables being discarded by the stepwise multiple regression analysis. These were :

- Process Technology and Customer Dependence for Specialization;
- Power Control for Formalization;
- Environmental Change, Organization Life-cycle, and Organization Size for Standardization;
- Process Technology for the CEO's Span of Control;
- Organization Size and Power Control for the Subordinate Ratio;
- Supplier Dependence and Organization Age for Organization Depth;
- Organization Age and Supplier Dependence for the Management Ratio;
- Internal Dependence, Supplier Dependence, and Environmental Change for the Indirect Worker Ratio;
- Customer Dependence and Internal Dependence for the Clerical Worker Ratio;
- Customer Dependence for Autonomy;
- Power Control and Supplier Dependence for Policy Decision centralization; and, finally,
- Organization Size for Organicity.

The Configuration variables of the Management Ratio and the Indirect Worker Ratio both showed completely new causal variables. So the addition of the thirty-seven organizations that comprised SIC code 36 had a considerable overall influence on this group.

4.13. Subgroups in the Manufacturing Sector : Concluding remarks.

The above analysis concludes the examination of the total research sample at a more focused level. A number of nuances between the various SIC-coded subgroups and combinations of subgroups were highlighted, illustrating the sensitivity of the predictive relationships to the type of industry or activity that is carried out by a particular subgroup. Obviously, the relationships and the variables that were identified were very dependent upon the default admission or exclusion criteria that were employed in the regression analysis. A higher, or lower, level of significance would have made considerable difference to the actual numbers of variables included or excluded at each step. Nevertheless, the overall trend would have remained similar.

It was not possible to employ the Importance Index that was developed earlier in this chapter to evaluate the overall importance of each dependent variable, simply because the sample sizes for the various subgroups varied too much. It will be recalled the effect of the sample size on the magnitude of the correlation coefficients was quite substantial. So smaller groups with much larger R values would skew any attempt to calculate an Importance Index. All the same, some idea of overall tendencies with respect to the independent variables can be gauged by simply looking the frequency with which they occurred. These are illustrated below :

Independent Variable	Frequency
Organization Size	43
Internal Dependence	36
Workflow Integration	20
Environmental Change	21
Supplier Dependence	20
Power Control	17
Operating Environment	16
Process Technology	15

Organization Age	10
Customer Dependence	9
Unpredictable Environment	6
Organization Life-cycle	5

Once again, the pervasiveness of the original causal variables of Size, Dependence and Technology, which were first identified by the Aston group, is apparent.

This section concludes the quantitative analysis of the possible links between organization structures and their environments in the manufacturing sector. The search for meaningful causal relationships will now shift to the concept of *Organization Climate* in an attempt to identify the influences both within an organization and external to an organization that shape and mould its climate.

However, before the analysis of organization climate is presented - and in the context of the structural arrangements of industry subgroups, it would be appropriate at this juncture to digress briefly and revisit the South African Electronics Industry.

5. THE SOUTH AFRICAN ELECTRONICS INDUSTRY.

It will be recalled that it was the apparent structural anomalies within the Electronics Industry in South Africa that first triggered the desire to follow this line of research. There is no SIC code in the Bureau of Market Research's data base which is devoted to the Electronics Industry exclusively. In any event, the Electronics Industry, *per se,* is not entirely a manufacturing industry and much of its dealings are also devoted to service, supply, project management, engineering and research and development activities. The information that was gathered for this study with respect to the Electronics Industry is mainly qualitative and was gleaned from the writer's own experience as a senior manager in the Allied Electronics group, as well as in conversation with a number of key informants in the industry.

The apparent incongruities in the South African Electronics Industry which were touched upon in the first chapter are recapped below.

The Electronics Industry in South Africa appears to be characterized by predominantly bureaucratic structures. Organizations are generally mechanistic in form and function and are strongly hierarchical. The reward and remuneration systems are extraordinary in order to cope with a historical shortage of skilled professional people. There is, therefore, a high degree of structuring of activities and formalization. For example, strong emphasis is placed on formalized systems such as job grading schemes and salary scales, particularly as they relate to fringe benefits such as a company car entitlement.

The conventional wisdom is that high tech. industries, by definition, function in a fast-changing and turbulent environment. A mechanistic form would, therefore, be incapable of providing the flexibility and speed required to be competitive in such a fast-changing, dynamic industry. And yet, among South African high tech. firms, the organic form is the exception rather than the rule.

Apart from important local advances, particularly in the fields of telecommunications, weaponry and defence, the technology employed by the South African Electronics Industry is mainly imported, with successful variations being engineered for South African operating conditions. Adaptations and products developed by local software industries can legitimately be described as leading edge applications - and South Africa's information systems technology is up with the best in the world.

The paradox, then, is that despite its apparent structural peculiarities, the South African Electronics Industry is generally effective - both competitively and technologically speaking. It was in pursuit of answers to this apparent paradox that three key role players in the Electronics Industry were contacted and their views were canvassed. The three key role players were :

(i) **Mr Gerard Morse,** Senior General Manager of the Industrial

Development Corporation and Chairman of the Standing Committee for the Electronics Industry;

(ii) Dr David Jacobson, Technology Executive of the Altron group and President of the South African Institute of Electrical Engineers, and

(iii) Mr Dirk Desmet, General Secretary of the Electronics Industries Federation.

The common thread that emerged from interviews with all three of these key people was the influence of government on the industry and on the industry's environment.

5.1. The Industrial Development Corporation.

The Industrial Development Corporation, or IDC, is a state-owned body whose purpose is to promote South African industry. This it does by providing financial assistance as well as by its own business initiatives in partnership with established companies. It has a number of relationships with firms in South Africa, and in the Electronics Industry it has a shareholding in both electronics firms Siemens and Sames.

One of the key objectives of the IDC is to provide an advisory service to Government on such matters as, for example, the reform of tariff policies. With respect to the Electronics Industry, the vehicle by which the IDC carries out this function is the Standing Committee for Electronics, of which Mr Gerard Morse is the Chairman. The Standing Committee for Electronics is a forum consisting of about 30 people drawn from the private sector, government, organized labour and the large utilities such as Telkom, Escom and Transnet. The Standing Committee is tasked with formulating broad strategy. This it does by means of a number of working groups, which are active in areas such as, education, smart cards, and deregulation. In addition, the Standing Committee promotes ongoing initiatives in the form of a Support Programme for Industrial Innovation as well as facilitating the efforts of the Electronics Industries Federation.

Historically, the Electronics Industry in South Africa has been very protected. In the 1960s and 1970s two parties, Telkom and Armscor, decided that they wanted a local Electronics Industry. Proceeding from a mindset that supported local industry, they entered into very long term (15 year) contracts with local manufacturers and suppliers. In the years of international sanctions and boycotts, it became apparent that in order to keep the country's aging telecommunications and defence systems, including aircraft and warships, up to date, a local key electronics capability would have to be developed. Joint projects and cost-plus financing arrangements were entered into and, at one stage, government agencies accounted for 50% of all electronics output.

All of this, obviously, had very strong implications for the environment in which the local industry functioned. In the words of Mr Morse, a capable local electronics industry was developed; although an internationally competitive industry did *not* happen. Certainly, the lack of turbulence and competitive pressure resulting from supportive government policies meant that the Electronics Industry was able to institute the types of bureaucratic controls associated with maximum control and efficiency in a relatively placid operating environment. Hence the proliferation of mechanistic structures.

As to the future, the IDC believes that confidence and certainty are essential ingredients to the successful transition of the Electronics Industry from a protected local industry into a competitive global player. Mr Morse chairs a working group in the Standing Committee which is dedicated to strategy formulation, providing recommendations on how government can positively influence, intervene in, and guide the industry. He believes that government guidance is critical in aiding and assisting the industry. He cited examples in the United States such as man on the moon, star wars, the Hubbel telescope, and the proposed permanent space station as being major government initiatives which will benefit the Electronics Industry enormously.

5.2. The Electronics Industries Federation.

As its name suggests, the Electronics Industries Federation (EIF) is a representative body of organizations that are active in the Electronics Industry. The EIF represents all of the major players in the Electronics Industry in South Africa.

Mr Dirk Desmet is the General Secretary of the EIF and he was also interviewed by the writer. Significantly, he also dwelt on the impending changes in the environment of the industry. The EIF has coined the slogan "Transition without Trauma" to characterize the changes that are now faced by the Electronics Industry, and the influences that need to be brought to bear to facilitate the transition.

Historically, the South African Electronics Industry has been dominated by just six large organizations and the basic research was mainly from overseas. This is set to change rapidly as local markets become open and as local needs are identified.

A recent survey, for example, had shown that access to communication was a primary need in developing households, coming third in order of importance after housing and food. Prepaid or smart cards are, therefore, important for future development as an easy means of payment for utilities and services.

Mr Desmet said that the largest threat to South African manufacturers lay in their poor productivity. The local companies that succeed will be those that have invested in Technology and are competitive.

5.3 The Allied Electronics Group.

The Allied Electronics (Altron) group of companies is by far the largest player in the Electronics Industry in Southern Africa. Its Chairman, Dr Bill Venter, is a member of numerous national and indust-

ry policy formulating bodies, including the President's Economic Advisory Council. The influence of the Altron organization on the Electronics Industry is, therefore, substantial.

For the purpose of this study, the Group Technology Executive of Altron, Dr David H Jacobson was interviewed. Dr Jacobson is also a member of several national and industry bodies, including the Governing Council of the EIF and the IDC's Standing Committee for Electronics, that was mentioned earlier.

Dr Jacobson's special brief is Technology Development and in the interview he also focused on the transition that is facing the Electronics Industry and what the government's response should be in terms of helping the industry to steer a course for survival and growth. He highlighted seven incentives to encourage small, medium and large businesses in a variety of fields : (Jacobson, 1993)

- Tax credits for expanding Technology Development facilities and for Technology Development projects.
- Accelerated depreciation.
- Tax credits for new equipment designed and/or manufactured locally.
- Direct grants or 'matching funds' for Technology Development.
- Export incentives and overseas marketing assistance.
- Inexpensive ground, factory and home rentals on 'technology parks'.
- Tax holidays for new enterprises.

All of these measures, and more, have been successfully applied in Pacific Rim countries. Implicit in all of the incentive measures is an attempt to provide stability and predictability to the operating environment.

5.4. Appropriate Structures

'Appropriate Technology' is a buzz-word that is much favoured by Dr Jacobson when he speaks of the development of local solutions for local problems. Similarly, one may speak in terms of Appropriate

Structures in the context of local organization designs to suit local conditions.

Certainly, it becomes apparent that mechanistic structures have, up until now, been entirely appropriate for the South African Electronics Industry. So the apparent structural anomalies that triggered this research project are not so anomalous when considered against the background of the prevailing operating conditions and environment.

A lot of attention has been paid in this chapter to the study carried out by Kim and Utterback (1983) in South Korea and their finding that organization structures tend to follow a reverse life-cycle in a developing country. They speculated that the differences between developed and developing countries stemmed from directional differences in environmental change. In a developing country the environment moves from relatively stable to more turbulent as an organization grows and is less protected and comes into contact with foreign competition for the first time. Its structure would then become more organic and flexible at a later stage of its life cycle as a strategic response to increased environmental pressure.

Although this sequence is analogous to the South African situation, there are some key differences. The main difference is that the protected, stable phase has endured very much longer than in other developing countries as a result of this country's status as international pariah for so many years. Mechanistic structures have, therefore, become very much more entrenched. The close relationship between the Electronics Industry and government agencies, coupled with a pervasive siege mentality, has also reinforced the value of a structured, bureaucratic, almost militaristic way of doing things.

It is important for the leaders of the Electronics Industry to grasp that, despite the pressure to reorganize to face the threat of overseas competition, there are still numerous advantages to be had from being a large bureaucracy. It is likely, therefore, that a

local hybrid organizational type will evolve quite rapidly to cope with new external pressures but, at the same time, retain most of the efficiencies and controls that have been acquired and built up over many years. Something like the Stratocracy variant of organization structure that was described on pages 79 to 81, which combines the reaction speed of an organic structure with the efficiencies of a mechanistic structure.

6. STRUCTURAL ANALYSIS: CONCLUDING REMARKS.

At the outset, the purpose of this chapter was stated as being to thoroughly explore the relationships that exist between manufacturing organizations and their environments and to highlight the statistical associations. With the extensive multiple regression equations that were constructed for the total sample and also for the various SIC groups, this objective has now been fulfilled from a quantitative point of view. From a purely qualitative base, the discussion of the South African Electronics Industry has provided support for the causal connections that were apparent in the quantitative analysis; as well as vindicating the viewpoint that circumstances in South Africa often are very different from those of developed countries. Consequently, some of the precepts of 'classical' Organization Theory either do not apply or apply *differently* in a local setting.

The focus of the causal analysis will now shift to Organization Climate. In the pursuit of extracting meaningful relationships, both contextual elements and structural influences were treated as independent variables for the purpose of extracting important relationships.

7. ORGANIZATION CLIMATE.

The multiple regression analyses of the nine Organization Climate variables that were used in this study are presented in the following pages. The variables are set out again below, according to the categories into

which they were originally grouped.

1. **Authority**
   - (i) Leaders' psychological distance
   - (ii) Concern for employee development
   - (iii) Questioning authority
2. **Restraint**
   - (iv) Emotional control
3. **Work Interest**
   - (v) Scientific and technical orientation
   - (vi) Intellectual orientation
4. **Personal Relations**
   - (vii) Interpersonal aggression
5. **Routine**
   - (viii) Rules orientation
   - (ix) Readiness to innovate

The format of the analyses differs from that used in the main structural analysis of the total sample only in that Tolerance statistics, indicating the degree of collinearity of every independent variable, are now included in each diagram. The independent variables are split, firstly, into those of context, i.e. the *independent* variables of the first part of this study; and secondly, those of structure, i.e. the *dependent* variables of the first part of this study.

For the rest, each diagram contains the usual output from each regression equation with the significant independent variables arranged in descending order according to their 'F' ratios. The default criteria for inclusion or termination of a variable from the stepwise multiple regression equations were the same as those used in the first part of this study, i.e. PIN = 0,05 and POUT = 0,10.

7.1. Authority.

In the context of organization climate, there were three components

to the perceptions of Authority within an organization that were examined by this study. The three components were : (i) Leaders' Psychological Distance, (ii) Concern for Employee Involvement and (iii) Questioning Authority. The multiple regression analyses of both the contextual and structural independent variables are set out below.

7.1.1. Leaders' Psychological Distance.

The main predictive relationships with respect to the perceptions of organization leaders' psychological distance are illustrated in figure 8.24.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Toler-ance
Context :						
Power Control	0.2217	0.2217	0.0492	23.5700	0.0000	0.9758
Organization Size	0.0893	0.2547	0.0649	15.7790	0.0000	0.9758
Structure :						
Organicity	−0.2802	0.2802	0.0785	38.8500	0.0000	0.9466
Policy Decisions	0.1703	0.3223	0.1039	26.3777	0.0000	0.9887
Autonomy	−0.1706	0.3363	0.1131	19.2980	0.0000	0.9372
Executive Span	0.0690	0.3486	0.1215	15.6691	0.0000	0.9929

Figure 8.24 Predicting Leaders' Psychological Distance.

Insofar as the contextual independent variables are concerned, there is a positive relationship with both Power Control and Organization Size. So leadership is perceived to be distant when there is a high degree of political activity and as organizations get larger, and relationships possibly become less intimate and more formal. It will be recalled that the item analysis of the scale which measured Leaders' Psychological Distance revealed two factors : one dealing with political manipulation and manoeuvring and the other with the mode of address and politeness toward senior employees. So the contextual variables seem to be very consonant with what this scale actually measured.

Looking at the structural independent variables that were significant, there were negatively directed relationships with Organicity and Autonomy and positively directed relationships with Policy Decision Centralization and the CEO's Span of Control. So mechanistic structure is associated with perceptions of psychologically distant leadership. Centralization of policy decisions and lack of autonomy from a holding group or company also contribute to this perception. Finally, there is a small contribution by the span of the CEO's direct subordinates - the broader the span the more distant the leadership is perceived to be.

In terms of the possible collinearity of the independent variables, examination of the Tolerance statistics indicates that they are all very high. And so collinearity of the independent variables was not a problem.

7.1.2. Concern for Employee Involvement

The second component of the Authority dimension of organization climate is concerned with the perception of the amount of concern

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Tolerance
Context :						
Power Control	−0.2477	0.2477	0.0613	29.7958	0.0000	0.9376
Organization Age	−0.1091	0.2699	0.0729	17.8768	0.0000	0.9991
Operating Environment	−0.0291	0.2847	0.0811	13.3501	0.0000	0.9370
Structure :						
Autonomy	0.2490	0.2490	0.0620	30.1523	0.0000	0.9446
Formalization	0.1686	0.2956	0.0874	21.7868	0.0000	0.9945
Organicity	0.2082	0.3389	0.1148	19.6312	0.0000	0.9433

Figure 8.25 Predicting Concern for Employee Involvement.

that is shown in an organization for the total involvement of all its employees. The main predictive relationships are shown in

figure 8.25, where it will be seen that there were three variables each from both the contextual group and the structural group which passed the default criteria for inclusion in the regression equation. It will be recalled that the item analysis for this particular measure yielded a unidimensional solution.

Insofar as the contextual variables are concerned, all three exhibited negatively directed relationships. This means that concern for employee involvement is apparently more evident in younger organizations, where there is less political activity, and which function in a relatively placid operating environment.

Looking at the structural influences, Autonomy, Formalization and Organicity were all positive predictors of a climate which values employee involvement. So one would expect employee involvement to be greater in organizations that: (i) are free from direct control by a holding group or company, (ii) have a high degree of formalization, and (iii) have an organic structure and management philosophy.

The situation regarding formalization is interesting and deserves further comment. There is no doubt that some aspects of organization climate are more desirable than others, particularly when looked at from an *organization effectiveness* point of view. Depending on the objectives of the organization, aspects of its climate can assist and be facilitating, or can hinder and be obstructive. In this study, formalization appeared several times as a causal variable which was positively related to the facilitating aspects of organization climate; and sometimes the link was surprisingly strong.

This tends to give the lie to the somewhat trendy viewpoint, popular particularly among many creative people such as electronic engineers and the like, that formalized systems and methods act as shackles to the free flow of thoughts and ideas, and are antithetical to inventiveness, cerebral challenge and innovation.

This line of thought is pursued in the sections below where formalization occurs several more times as a significant predictor.

7.1.3. Questioning Authority.

The third aspect of the Authority perception of organization climate concerns the degree to which questioning of authority is both condoned and encouraged. There were two relationships identified with the contextual independent variables and five with the structural independent variables. These are illustrated in figure 8.26.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Tolerance
Context :						
Power Control	−0.2603	0.2603	0.0678	33.1491	0.0000	0.8723
Environmental Change	0.2177	0.2925	0.0856	21.2899	0.0000	0.8723
Structure :						
Organicity	0.3069	0.3069	0.0942	47.4218	0.0000	0.8929
Formalization	0.1994	0.3754	0.1409	37.3169	0.0000	0.9055
Autonomy	0.2115	0.3986	0.1588	28.5766	0.0000	0.9389
Standardization	−0.2440	0.4161	0.1731	23.7066	0.0000	0.8681
Organization Depth	−0.1218	0.4313	0.1860	20.6602	0.0000	0.9865

Figure 8.26 Predicting Questioning Authority.

The contextual variables were Power Control, which showed a negatively directed relationship, and Environmental Change which was positively related. So one would find that organizations that are less politically driven and which operate in a changing environment to be more inclined to a climate which challenges the status quo and which questions authority.

These circumstances are supported by the relationships with the structural variables. Organicity, which is itself associated with non-political leadership and a changing environment, exercises the greatest influence on a climate in which people feel encouraged to

test limits and to challenge accepted policies and methods. Leaving aside formalization for a moment, the relationships with the final three structural predictors also support this view and the linkages are fairly obvious; viz. organizations that :

- are independent of control by a holding company or group,
- are low on routine and standardization, and
- have shallower structures

are supportive of a questioning climate.

Looking at formalization, the relationship is, again, less obvious and even seems to be out of place in the context of shallow, organic structures which are independent, free from routine and political power struggles, and which function in a changing environment. Formalization is, after all, the dimension of organization structure that is most readily associated with bureaucracy.

Does this mean that bureaucracy and organic structures are not necessarily mutually exclusive?

7.2. Restraint

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Toler-ance
Context :						
Environmental Change	−0.1767	0.1767	0.0312	14.6930	0.0001	0.8674
Power Control	0.1735	0.2126	0.0452	10.7658	0.0000	0.8718
Supplier Dependence	−0.0774	0.2333	0.0544	8.7133	0.0000	0.9916
Structure :						
Organicity	−0.2399	0.2399	0.0576	27.8532	0.0000	0.9110
Standardization	0.2357	0.3056	0.0934	23.4344	0.0000	0.9123
Autonomy	−0.1914	0.3320	0.1102	18.7478	0.0000	0.9389
Policy Decisions	0.1574	0.3471	0.1205	15.5156	0.0000	0.9493

Figure 8.27 Predicting Emotional Control.

There was only a single measure of the concept of Restraint as it applies to perceptions of organization climate. This was a scale for Emotional Control. It will be remembered that this scale, when

subject to an item analysis, yielded two factors - one dealing with the display of feelings or emotion and the other with the amount of emotion. The main predictive relationships are shown in figure 8.27. It will be seen that there were three contextual variables and four structural variables which were highlighted as significant by the regression analysis.

Two of the contextual relationships are negatively directed and one of these, that with Supplier Dependence, is a very weak correlation. Essentially, then, looking at the other two relationships, it may be said that organizations that are politically driven and controlled and which function in a stable environment, would tend toward a higher degree of emotional control.

Looking at the influence of the structural variables, positive relationships were thrown up for Standardization and Centralization of Policy Decisions; while negative relationships were indicated for Organicity and Autonomy. So one would expect emotional control to be more prevalent in organizations that have mechanistic structures and a high degree of standardization and routine. Control by a holding group or company and centralization of decisions affecting policy would also exercise an influence on the degree of emotional control.

The multicollinearity analysis indicated that two independent variables had Tolerance statistics slightly below the 0,90 level. These were Power Control and Environmental Change. It is possible that a weak collinear relationship did exist between these variables because the only time that the tolerance level of Power Control dropped below 0,90 is when it appeared concurrently with Environmental Change. Nevertheless, the magnitude of the Tolerance statistics is still acceptable and the possible collinearity is so small that it can be discounted.

7.3. Work Interest

The third element of organization climate that was examined concerns

Work Interest and was made up of two components : (i) Scientific and Technical Orientation, and (ii) Intellectual Orientation. It will be recalled that when the factor analysis of all the organization climate variables together was performed (see pages 191 and 192), these two items were combined into one component factor which was labelled 'Cerebral Stimulation'.

The regression analyses for both of these scales produced a large number of predictors and, considering that the full sample was used, some of the correlations and multiple correlations were very high indeed.

7.3.1. Scientific and Technical Orientation.

The multiple regression analysis of the Scientific and Technical Orientation scale yielded 6 contextual and 4 structural independent variables, as shown in figure 8.28.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Tolerance
Context :						
Workflow Integration	0.2915	0.2914	0.0849	42.330	0.0000	0.9034
Power Control	−0.2603	0.3587	0.1286	33.596	0.0000	0.8139
Environmental Change	0.2211	0.3797	0.1441	25.495	0.0000	0.8121
Process Technology	0.1541	0.3934	0.1547	20.740	0.0000	0.9241
Operating Environment	0.1825	0.4039	0.1631	17.625	0.0000	0.8889
Supplier Dependence	−0.0868	0.4133	0.1708	15.492	0.0000	0.9836
Structure :						
Formalization	0.4419	0.4418	0.1952	110.64	0.0000	0.8336
Standardization	−0.3078	0.4820	0.2323	68.852	0.0000	0.9011
Policy Decisions	−0.2663	0.4912	0.2413	48.148	0.0000	0.8581
Autonomy	0.1263	0.4986	0.2486	37.473	0.0000	0.9844

Figure 8.28. Predicting Scientific and Technical Orientation.

In terms of organizational context, the following relationships were evident :

- More automated technology is associated with a scientific and technical orientation. It is to be expected that technological

sophistication would be reflected in organization climate.

- Power Control is negatively related to a scientific and technical orientation. The converse of this relationship is that one would expect that a high degree of political infighting would hinder the purely scientific and technical thinking challenge in an organization.
- A higher degree of environmental change is also a predictor of scientific and technical activity. The latest technological advances in an organization's environment would, no doubt, actively influence this aspect of its climate.
- Process technology, in the same vein as the other technology measure, also exercises an influence on the degree to which a company's climate is scientifically and technically oriented.
- An organization's operating environment is positively associated with its scientific and technical orientation. Turbulence in the operating environment possibly acts as a stimulus to solving the technological problems brought about by environmental uncertainty.
- The final contextual relationship is a negatively directed and weak link with Supplier Dependence. Quite why backward integration should influence climate, albeit weakly, is not immediately clear.

Turning to the four structural independent variables, it will be seen that the strongest link by some way is with Formalization. Insofar as the other three independent variables, apart from formalization, are concerned, their relationships with an organization's scientific and technical orientation are characterized by freedom: freedom from routine, freedom from centralized decision making, and freedom from control by a holding company or group. Again, formalization appears to fly in the face of this trend in that one would have expected freedom from bureaucracy to be associated with the trend. And yet formalization is strongly related to a scientific and technical orientation to the extent of a correlation of 0,44, which is very strong, and an F Ratio that is exceptionally high and very significant.

So, far from inhibiting and stifling the creative processes, it seems that a high degree of formalization actually *stimulates* them!

Every job has its banal and routine aspects. The existence of formalized systems and routines could well take care of the humdrum things that must be done; and organization members are then freed to pursue creative activities in an unfettered way. Formalization could thus be the foundation upon which free-flowing creativity is based.

Examination of the possible collinearity that exists in this particular regression equation indicates that, of the structural variables, formalization and centralization of policy decisions both have Tolerance statistics that are less than 0,90. The situation here is possibly similar to that of Power Control and Environmental Change in that whenever these variables occur concurrently their Tolerance levels fall slightly, indicating the possibility of some slight collinearity. Nevertheless, the tolerance statistics are still high enough to be considered satisfactory and not to pose any threat to the integrity of the analysis.

7.3.2. Intellectual Orientation.

The second variable in the Work Interest category of organization climate was that of Intellectual Orientation. This measure was the other half of the 'Cerebral Stimulation' factor that was extracted during the factor analysis. The trends emerging from the multiple regression were very similar to those of the Scientific and Technical Orientation. This is evident in figure 8.29, except that the contextual variables now number four and the structural variables number six in total.

Looking firstly at the contextual predictors, the similarity to the relationships identified in the previous section are quite

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Toler-ance
Context :						
Workflow Integration	0.2868	0.2868	0.0822	40.8642	0.0000	0.9077
Power Control	−0.2682	0.3603	0.1298	33.9278	0.0000	0.8334
Environmental Change	0.2460	0.3897	0.1519	27.0955	0.0000	0.8608
Process Technology	0.1423	0.4000	0.1600	21.5758	0.0000	0.9279
Structure :						
Formalization	0.3977	0.3977	0.1581	85.6530	0.0000	0.8135
Standardization	−0.3112	0.4492	0.2018	57.5008	0.0000	0.8708
Policy Decisions	−0.3074	0.4748	0.2254	44.0447	0.0000	0.8238
First Line Discretion	−0.2736	0.4863	0.2365	35.0763	0.0000	0.8511
Autonomy	0.1442	0.4955	0.2455	29.4209	0.0000	0.9830
Clerical Worker Ratio	0.1522	0.5045	0.2545	25.6632	0.0000	0.9851

Figure 8.29 Predicting Intellectual Orientation

apparent. All of the relationships are in the same direction and are of the same sort of magnitude as the other Work Interest variable. The comments that were made with respect to these four variables in the previous section would apply again in this section.

Turning to the structural variables, the analogy with the previous section continues. Formalization is the major predictor of Intellectual Orientation with high correlations and a very significant F ratio. Freedom from routine, centralization and control is supplemented by the inclusion of a negatively directed relationship with another centralization measure - that of first line discretion. So freedom of first line supervisors to use their own discretion can be added to the other 'freedoms' inherent in a climate that stimulates cerebral challenge and thinking activity. The final addition to the ranks of structural variables is the Clerical Worker Ratio. So a larger number of clerical workers and support activities is also associated with an organization where thinking activities are more prevalent.

Oddly, the influence of organic structures was absent from both measures of Work Interest or 'cerebral stimulation'. One of the

accepted spin-offs of an organic structure is supposedly its propensity to encourage lateral communication and the free flow of ideas and the interchange of viewpoints between different disciplines and departments. This is apparently not so in South African manufacturing organizations, although this assertion must be read together with the findings on the Readiness to Innovate scale on page 288 below.

Finally, looking at the collinearity of the independent variables, all of the Tolerance statistics were high enough to encourage confidence that any possible collinearity was within acceptable limits. The situation regarding the possible weak link between Power Control and Environmental Change, and between Formalization and Policy Decision Centralization, was again apparent.

7.4 Personal Relations

The only measure used to gauge organization climate with respect to the dimension of Personal Relations was a scale for Interpersonal Aggression. The main relationships are illustrated in figure 8.30.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Tolerance
Context :						
Power Control	0.2029	0.2029	0.0412	19.5826	0.0000	0.9378
Operating Environment	0.0649	0.2354	0.0554	13.3446	0.0000	0.9378
Structure :						
First Line Discretion	0.1496	0.1496	0.0224	10.4323	0.0000	0.9244
Autonomy	−0.1472	0.2022	0.0409	9.6967	0.0000	0.9937
Formalization	−0.1322	0.2227	0.0496	7.8964	0.0000	0.9285

Figure 8.30 Predicting Interpersonal Aggression.

It will be remembered from the item analysis of the organization climate scales that this measure was concerned primarily with the outward and physical manifestations of aggression. It is, therefore, not surprising that Power Control comes out as the most potent predictor

of all the independent variables.

One would assume that, most of the time, interpersonal aggression would be an undesirable organization trait - particularly if it is allowed to reach pathological proportions. While it is accepted that a certain, minimal, amount of tension, or aggression, or stress - or call it what you will - is necessary for optimal functioning, one can, nevertheless, make the general statement that a climate of interpersonal aggression within an organization is probably dysfunctional.

From a structural variable point of view, interpersonal aggression is predicted by the restriction of autonomy and first line supervisory discretion. Interestingly, formalization - which is so strongly linked to the positive dimensions of organization climate - is here evident in a negatively directed relationship. So a *lack* of formalization is a possible cause of interpersonal aggression within an organization.

Looking at Tolerance statistics, all of the independent variables for both context and structure were very high. So collinearity did not enter into the equation.

7.5. Routine.

The final element of organization climate to form part of this study was that of Routine. It consisted of two components : (i) Readiness to innovate, and (ii) Rules Orientation. Both of these variables formed the major part of a factor called 'Acceptance of Rules and Restraints' which was identified in the factor analysis of all the organization climate variables.

7.5.1. Readiness to Innovate.

According to the item analysis that was carried out earlier in this study on the Readiness to Innovate scale, it consisted of

two factors. The first was concerned with the generation of ideas inventions, and discoveries, and the second was concerned with speed and flexibility.

The regression analysis isolated 11 independent variables - four were contextual variables and the other seven were structural. They are all illustrated in figure 8.31.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Toler-ance
Context :						
Power Control	−0.3249	0.3249	0.1055	53.8072	0.0000	0.8544
Environmental Change	0.2995	0.3796	0.1441	38.2974	0.0000	0.8600
Organization Size	−0.0491	0.3997	0.1597	28.7647	0.0000	0.9594
Internal Dependence	−0.0822	0.4169	0.1738	23.8293	0.0000	0.9879
Structure :						
Organicity	0.3892	0.3892	0.1515	81.3920	0.0000	0.8925
Autonomy	0.2993	0.4449	0.1979	56.1376	0.0000	0.9323
Standardization	−0.2791	0.4837	0.2340	46.2232	0.0000	0.8356
Formalization	0.1784	0.5032	0.2533	38.4081	0.0000	0.8152
Policy Decisions	−0.2010	0.5118	0.2619	32.0838	0.0000	0.8562
Executive Span	−0.0380	0.5198	0.2702	27.8222	0.0000	0.9626
Organization Depth	−0.1006	0.5258	0.2765	24.5688	0.0000	0.9792

Figure 8.31 Predicting Readiness to Innovate.

Three of the contextual relationships - with Power Control, Size and Internal Dependence - were negatively directed. So, in terms of its context, an organization can be expected to exhibit a climate which facilitates innovation if :

- it is not characterized by political scheming and machinations,
- it functions in a changing environment,
- it is relatively smaller, and
- it is less dependent on a holding group or owning company.

Insofar as the structural influences are concerned, four of the independent structural variables exhibited relationships that were negatively directed. These were Standardization, Centralization, CEO's Span of Control, and Organization Depth. The positively directed relationships, therefore, were with Organicity, Autonomy,

and Formalization. So a climate of readiness to innovate thrives in organizations that :

- are more organically structured,
- are decentralized and autonomous,
- have less routine and standardization,
- have a higher degree of formalization,
- have a higher degree of centralization of policy decisions, and
- have a shallow structure with fewer direct reports to the CEO.

In contrast to the two measures of Work Interest or 'cerebral stimulation', Organicity features very strongly as a predictor of an innovative climate - which is, of course, in keeping with the 'classical' features that are attributed to an organic structure. Again, formalization stands out as the enigma in that a higher degree of formalization also appears to be conducive to an innovative climate.

As usual, a look was taken at the Tolerance statistics of the independent variables of the regression equation. Because of the larger amount of predictors there was a fair spread of values of the Tolerance statistics, ranging from 0,815 at the low end to 0,988 at the highest. On balance, it was considered that the degree of collinearity did not pose any great concern to the validity of the analysis.

7.5.2. Rules Orientation

The second component of the Routine element of organization climate concerned an organization's orientation to rules. Here, in the item analysis carried out earlier, two factors were revealed. One had to do with the display of rules and the expectation of obedience, while the other was more concerned with the degree of actual compliance.

Independent Variables	Single R	Multiple R	R^2	F Ratio	Significance Level	Toler-ance
Context :						
Customer Dependence	0.1216	0.1216	0.0148	6.8453	0.0092	1.0000
Structure :						
Organicity	−0.2954	0.2954	0.0872	43.5822	0.0000	0.9407
Formalization	0.1133	0.3111	0.0968	24.3756	0.0000	0.8209
Policy Decisions	0.1043	0.3395	0.1153	19.7141	0.0000	0.8618
Standardization	0.1436	0.3545	0.1257	16.2818	0.0000	0.8596

Figure 8.32 Predicting Rules Orientation.

The regression analysis revealed only one contextual predictor variable and four structural predictors, as can be seen in figure 8.32. The single contextual relationship was a smallish positive link with Customer Dependence, indicating that the more dependent an organization is on its single biggest customer, the more inclined the organization is to display and obey rules and regulations. Possibly, the single biggest customer is in a power position which allows it to dictate its own terms and conditions to ensure continuity of supply from the organization.

Regarding the structural independent variables, organizations with a strong rules orientation tended to be more mechanistic in structure; and more formalized, centralized and standardized. All of these relationships are probably to be expected in an environment where compliance is paramount - and so there were no real surprises in this analysis.

Collinearity was considered to be within acceptable limits, as was indicated by the Tolerance statistics.

To conclude this discussion on the predictive relationships that were identified in the multiple regression analysis of the organization climate variables, some general observations are set out below.

7.6. Organization Climate : General Comments.

The comparative frequencies with which each independent variable occurred is set out below in figure 8.33 for both the contextual variables and the structural variables.

Contextual Variables	Frequency	Structural Variables	Frequency
Power Control	8	Autonomy	8
Environmental Change	5	Formalization	7
Operating Environment	3	Policy Decisions	6
Organization Size	2	Organicity	6
Process Technology	2	Standardization	6
Supplier Dependence	2	First Line Discretion	2
Workflow Integration	2	Executive Span	2
Organization Age	1	Organization Depth	2
Customer Dependence	1	Clerical Worker Ratio	1
Internal Dependence	1		

Figure 8.33. Climate : Frequency Distribution of Independent Variables

Insofar as the contextual variables are concerned, Power Control is by far the most pervasive predictor and this variable, together with the two environmental measures, account for the majority of the external contextual influences that shape and mould organization climate as a whole. The influence of the structural variables is more evenly spread with Centralization, Formalization, Standardization and Organicity all exercising a fair amount of influence on climate.

In a study carried out in the United kingdom, Payne and Mansfield (1973) found that Organization Size, Internal Dependence, Organization Age, and Workflow Integration were the primary contextual predictors; and Specialization, Formalization, Executive Span and Autonomy were the main structural influences. Size and dependence were by far the most influential pressures on organization climate and, in this regard, their findings are similar to the original Aston findings with respect to organization structure.

The total absence of Specialization as a predictor of organization climate in South African manufacturing organizations is intriguing. Specialization, as a structural variable, would reflect the expertise, tertiary qualifications, and collective brain power of an organization. And yet it did not feature as a predictor in any of the elements of organization climate - least of all the Innovation and Cerebral Stimulation variables. By contrast, in the United Kingdom study, Payne and Mansfield (1973) identified quite strong links between specialization and Scientific and Technical Orientation (R = 0,43), Intellectual Orientation (R = 0,34), and Readiness to Innovate (R =0,35).

Payne and Mansfield (1973) make the point that there is sometimes a considerable difference between the perceptions of organization climate that are held by an organization's management corps when compared to, say, its first line hourly-paid operators. The same situation would obviously apply with respect to this study and the perceptions of climate that have been analysed here are very definitely management perceptions. Of course, the situation is exacerbated in South Africa by the dichotomy between the first world and third world elements of the labour force, which was discussed in some detail in the previous chapter. It would also be true to say, then, that the perceptions of climate detailed in this study are those of the first world element of the workforce.

The strength of formalization as a predictor of organization climate is worthy of another mention. Formalization is the measure which most obviously taps aspects of bureaucracy and it was surprising to find that it was so powerfully connected to the innovative and thinking challenge activities of an organization. This perception of formalization is complemented by examining its co-relationships with respect to standardization and to organicity.

Formalization and standardization appear concurrently four times as causal variables, and on three of these occasions the causality is in opposite directions. So while formalization seems to be indicated

for creativity, innovation and thinking activities; standardization is contra-indicated for the same activities. Again, the distinction between these two structural variables in a South African context is apparent. It will be recalled that, in this study, formalization and standardization are not simply two sides of the same coin with respect to alternative control strategies, as was found to be the case in most other studies. Apparently, the same situation now also holds true with respect these variables' influence on organization climate.

Looking at the simultaneous occurrence of formalization and organicity, of the four times that this occurs, three are in the same direction of causality. So the situation here is that organic structure and bureaucracy, as measured by formalization, occurred concurrently 75% of the time. What this means is that in South African manufacturing organizations it is possible for an organization to be both bureaucratic and organic at the same time. The implication is that bureaucracy, as exemplified by a high degree of formalization, is not necessarily synonymous with mechanistic organization structure, as is often assumed to be the case.

This finding should also help to alleviate the bad press that bureaucracy has had for some time. Bureaucracy, *per se*, is not synonymous with inefficiency, ineptitude and waste. "Bureaucracy is merely a type of structure. It is not, . . .of itself, good or bad. In some situations it *is* inefficient. In others . . . it can be highly efficient." (Robbins, 1987 : 232).

In conclusion, it is worth noting that the configuration variables exercised very little influence on organization climate. This finding emphasises the futility of shuffling the physical structure and design of an organization in an attempt to positively influence its climate. Many South African companies - particularly in the high technology industries - have a penchant for reorganization as a knee-jerk response to any perceived peril, whether it be increased competition or declining profits. What this analysis has shown is

that, to be effective, any structural re-engineering or reorganization must be accompanied by the appropriate change levers that are illustrated in figure 8.33.

8. SUMMARY: PREDICTING STRUCTURE AND ORGANIZATION CLIMATE.

The above sections conclude the search for statistical associations and possible causal relationships with respect to the contextual, structural and organization climate variables that were examined in this study and for which data were gathered, treated and analysed.

The stage has now been reached in the sequential application of the Scientific Method - as was outlined in figure 4.1. on page 116 - where the research problem and the research hypotheses can be revisited with a view to testing the hypotheses and drawing some conclusions with respect to the resolution of the research problem.

This is the direction that this thesis will now pursue in the following pages. Clearly, when the research hypotheses were first formulated the extent of the information processed and the scope of the research findings could not be envisaged. And so another objective of the following sections of this exercise will be to suggest avenues for further research. These avenues of further research could take the form of further manipulation and treatment of the data gathered for this study; or they could include a completely fresh approach with other sectors of South African commerce or industry.

that, to be effective, any structural re-engineering or reorganization must be accompanied by the appropriate change levers that are illustrated in figure 8.33.

8. SUMMARY.

In this chapter the search for statistical associations and possible causal relationships with respect to the contextual, structural and organization climate variables for which data were gathered, treated and analysed was carried out.

The total sample was analysed first and each dependent structural variable was subject to a multiple linear regression analysis using all of the contextual variables as independent variables. The main predictive relationships that emerged at the default level of significance were then sequentially illustrated and discussed. Generally, the relationships that emerged were consonant with what has been established in studies that have been conducted elsewhere, although there were one or two notable exceptions. For example, technology did not feature at all as a predictor of specialization, and some support was found for a structural life cycle that is the reverse of that in developed countries. A situation that is similar to that of South Korea. (Kim and Utterback, 1983). Power Control, which is a variable not encountered in other studies and which was measured by a scale developed especially for this study, proved to be a compelling predictor of structure.

The level of analysis was then reduced to that of individual subgroups of industries that comprised the sample, based on their SIC codes. Again, a multiple linear regression analysis was conducted for every dependent variable in every SIC-coded subgroup and the prominent relationships were illustrated and discussed.

The apparent conundrum of mechanistic structures dominating in the South African electronics industry was then briefly re-examined and it was established that mechanistic structures and a high level of bureaucratic

control had, historically, been quite appropriate for the situation in the local electronics industry since its inception.

Finally, the analysis shifted to the concept of organization climate and the same procedure was followed. A multiple regression analysis was carried out for each of the organization climate variables using all of the contextual variables as independent variables. In addition, a second regression analysis was conducted for each climate variable using the structural variables as independent variables. All of these relationships were then illustrated and discussed. Compared to a similar study which was done in the United Kingdom (Payne and Mansfield, 1973), there were some significant differences in the South African situation. For example, size was not nearly as pervasive as it was in the British study and specialization, which featured very strongly in the British study, did not feature at all as a predictor of climate in South African manufacturing organizations. The relationship of formalization was also unusual in that it featured as a very strong predictor of innovation and scientific and intellectual orientation. The Power Control variable, which was absent from the British study, was the most powerful predictor of climate among the contextual variables in this study.

The stage has now been reached in the sequential application of the Scientific Method - as was outlined in figure 4.1. on page 116 - where the research problem and the research hypotheses can be revisited with a view to testing the hypotheses and drawing some conclusions with respect to the resolution of the research problem.

This is the direction that this thesis will now pursue in the following chapter.

CHAPTER NINE : THE RESEARCH PROBLEM AND HYPOTHESES.

1. INTRODUCTION.

In this, the final chapter, the research hypotheses will be examined to establish whether or not the results of this research support, partially support, or reject the various hypotheses. Although this study speaks of 'testing' the various hypotheses, it should be noted that the evaluation of whether or not the hypotheses are supported is a judgemental assessment. In other words, it is important for a study of this nature to establish whether there is *partial* support for a position or even the *amount* of support that exists. A simple go/no-go statistical test would, therefore, be inappropriate. In any event, the need for statistical purity was addressed at the stage of the multiple regression analyses when an F ratio was calculated for each and every combination of dependent and independent variables to express the null hypothesis that there was no linear relationship between the variables.

The research problem and its attendant subproblems will then also be recapped with a view to evaluating the degree to which the objectives that are implicit in the subproblems have been achieved by this study.

Clearly, when the research problem and hypotheses were first formulated the volume of the information that was gathered and processed and the scope of the research findings could not be envisaged. And so another objective of this final chapter will be to suggest avenues for further research. These avenues of further research could take the form of more manipulation and treatment of the data gathered for this study; or they could include a completely fresh approach with other sectors of South African commerce or industry, apart from manufacturing.

2. RESEARCH HYPOTHESES AND RESEARCH PROBLEM REVISITED

It will be recalled that the fourth research hypothesis was dealt with and resolved earlier in this study. Its treatment here will, therefore, be confined to just a short summary of the earlier discussion.

2.1. The First Hypothesis : Contextual Imperatives.

The first research hypothesis stated that :

South African manufacturing organizations are shaped and influenced by a number of contingencies and structural imperatives which determine their structure, design and functioning.

Prominent among these imperatives are organization size, power control, technology, dependence on external organizations or resources and the degree of environmental turbulence and change.

The results of this study have indicated broad support for this hypothesis, which accords with similar studies that have been carried out overseas in both developed and developing countries. There was also support for the 'culture free hypothesis' originally put forward by the Aston researchers, viz :

> The consistency of relationships between variables of organization context and of organization structure . . . support the 'bold' hypothesis that these relationships, notably between size and specialization and formalization and between dependence and autonomy, will hold for work organizations in all societies. The hypothesis infers that relationships will be constant in direction and . . . in magnitude irrespective of differences in structures or in contexts of structures . . . between societies.
> (Hickson *et al*, 1974 : 74)

Organization Size was the most pervasive causal variable in South African manufacturing organizations and the hypothesized links between dependence and autonomy were also present. The influence of Technology, especially the Workflow Integration variable which incorporated the automaticity of an organization's primary technology, was also strong.

New variables and variables not often used in other studies were also included in this study. For example, the Power Control independent

variable was developed specially for this study and proved to be a potent predictor of organization structure - to the extent that it out-performed all of the 'traditional' independent variables except organization size.

Three measures of an organization's environment were identified and refined for use in this study. One of these was labelled Unpredictability, but it unfortunately did not feature at all as a causal variable. The other two were much more successful as imperatives of organization structure. The most influential was the Operating Environment variable which incorporated familiarity of events, reaction speed to events, visibility of the future, and the geographical scope of business operations. The final measure of an organization's environment was a variable called Environmental Change which included the influence of socio-political, professional, methodological, and work skills-related change on an organization and its work.

Independent Variable	Frequency	Importance Index
Organization Size	7	1,85
Power control	7	1,68
Environmental Change	6	1,27
Organization Age	8	1,15
Internal Dependence	5	1,02
Operating Environment	6	0,99
Workflow Integration	5	0,98
Customer Dependence	2	0,19
Process Technology	1	0,15
Organization Life Cycle	1	0,10

Figure 9.1. Frequency & Importance of Independent Variables.

The relative frequency and importance of all the contextual influences or variables was discussed in some detail on pages 227 to 232. They are summarised above in figure 9.1.

2.2. The Second Hypothesis : Structural Relationships.

The second hypothesis stated that :

Organizations in the South African Manufacturing Sector are affected differently by contextual variables. Generally, structuring of activities (specialization, standardization and formalization) will be more closely related to size and power control and less closely to technology; while design or configuration variables will be related more closely to power control and technology and less closely to organization size. Centralization, or concentration of authority, will be related mostly to dependence and power control. There will, nevertheless, be significant differences between industries within the manufacturing sector.

There are five elements that make up this hypothesis : (i) the differential influence of contextual variables, (ii) the structuring of activities variables, (iii) the design or configuration variables, (iv) centralization or concentration of authority, and finally (v) group differences within the manufacturing sector. Each of these elements is treated sequentially below.

2.2.1. The Differential Influence of Contextual Variables.

In the course of the multiple regression analyses that were carried out on all of the structural variables it became it became clear that, while there were some contextual variables that were more pervasive than others, each of the dependent structural variables was linked to its own unique group or combination of contextual variables. Figure 8.10 illustrates this point very clearly. So this first aspect of the second hypothesis is supported by the findings of the research.

2.2.2. The Structuring of Activities Variables.

One of the first things that became clear during the item analyses and factor analyses of the dependent structuring variables was that the usual 'structuring of activities' cluster of variables that has normally been found in other studies did not apply in this study. Most notably, standardization was not simply the other side of the same coin as formalization, neither did it bear the usual close relationship with the other structural variables. This is, no doubt, partly due to the fact that a different scale to the normal Aston measure was used which embodied routinization rather than just standardization.

The hypothesized relationship with size was present for both specialization and formalization but not for standardization.

The postulated relationship with Power Control was only present for formalization, where it was negatively directed and weaker than the relationship with technology.

Technology was present as a predictor for standardization, but the other predictors for standardization were the environment and age and did not include either size or power control.

The relationships with size and technology were present for formalization and in the hypothesized proportions.

In summary, size was significant in 2 out of the 3 structuring of activities variables and power control was significant in only one. Technology feature in 2 of the 3 structuring of activities variables, but only once did it appear in the expected co-relationship with size. Relationships between structural variables and dependence and the environmental variables were significant but did not form part of this hypothesis.

In total, there was support for this aspect of the hypothesis but it was incomplete.

2.2.3. Design or Configuration Variables.

The three independent variables around which this aspect of the second hypothesis is formulated were present concurrently only once in the six configuration variables; and then the relationship is virtually the reverse of that postulated, i.e. organization depth was related more closely to size than to power control and technology. Size also figured as the most important predictor in the CEO's span of control and the subordinate ratio. In the latter case it appeared together with technology in a reversal of the postulated co-relationship. Of the other configuration variables, power control was the most important predictor for the indirect worker ratio and technology was the second most important for the clerical worker ratio.

In summary, the postulated strength of power control as a predictor of configuration did not materialize. While technology was apparent as a predictor for three of the six configuration variables it was never the most important. Size, on the other hand, was the most significant in three of the six relationships : with the CEO's span of control, with the subordinate ratio, and with organization depth. So, in the ongoing 'dispute' between advocates of the Technology imperative versus the Size imperative, as exemplified by Woodward (1958) and Hickson *et al*(1969), the situation in South Africa lends support to the size imperative.

Other variables which were influential in predicting configuration but which did not form part of this hypothesis were the operating environment, organization age, and dependence. Taken altogether, there was no support at all for this portion of the hypothesis in the form that it was expressed.

2.2.4. Centralization or Concentration of Authority.

Although it is not spelt out, the expected direction of the

relationship between centralization and dependence, and centralization and power control was positive in both cases, meaning that the relationship with autonomy, or decentralization, would be negative for both contextual variables.

Power control appeared in the expected direction in all three of the centralization measures and it was very significant in the centralization of both policy decisions and first line discretion. Dependence displayed the expected strong relationship with autonomy, but showed only a weak relationship with the centralization of policy decisions and no relationship at all with the centralization of first line supervisory discretion.

So, of the six expected relationships, four were present, one was present but in the opposite direction and one was not present at all. Again, there is some support for this part of the hypothesis, but it is incomplete.

2.2.5. Group Differences in the Manufacturing Sector.

Section 4 of chapter eight dwelt at some length on the intergroup differences between the various SIC codes that made up the research population. Figure 8.11 illustrated the range of mean scores on all of the contextual and structural variables for each of the eight SIC-coded subgroups of organizations. Each of the multiple regression analyses that were carried out for every SIC code revealed significant intergroup differences in the application and influence of the contextual variables to the structural variables.

These differences were also illustrated by the three trial combinations of SIC groups where it was demonstrated that the combination of seemingly similar industries into a larger aggregated group exercised a considerable effect on the independent variables that were identified as being significant predictors.

This final aspect of the second hypothesis can, therefore, be considered as being strongly supported by the research findings at a group level. Nevertheless, it was interesting to note that when the results of all the SIC groups' regression equations were taken together, the most frequently occurring variables were still the traditional ones of Size, Internal Dependence, and Technology. So despite many noteworthy intergroup variations there was still constancy in the overall occurrence of the core variables.

2.2.6. The Second Hypothesis : Summary.

In summary, there was modest support for the second hypothesis as a whole. There was complete support for the first and last aspects - independent contextual variables exercised differential influence on the structural variables; and there were significant differences between subgroups in the manufacturing industry in terms of the causal relationships between context and structure.

There was some support for the second and fourth aspects which depicted the relationships between context and structuring of activities, and context and centralization.

And, finally, there was no support at all for the third aspect which held that power control and technology would be the overriding predictors of configuration. Instead, the more traditional influences of size and technology were paramount.

2.3. The Third Hypothesis : Organic and Mechanistic Structures.

The third hypothesis stated that :

In South African Manufacturing firms, Organic Structures (characterized by participatory decision making, a decentralized hierarchy of

authority, and few formal procedures) will be associated with conditions of high environmental uncertainty and low dependence. Conversely, Mechanistic Structures will be associated with conditions of low environmental uncertainty and high dependence.

Testing the third hypothesis is somewhat problematic because some of the assumptions upon which it is based have been contradicted and challenged in another part of this study, albeit indirectly. It will be recalled that, in the discussion of organization climate, there was a strong link between formalization and many aspects of organization climate which are normally assumed to be the product of an organic structure and are supposedly antithetical to a bureaucratic structure. So the following comments must be read bearing in mind formalization's status as a possible 'wild card'.

Figure 7.9 on page 170 indicated that, in terms of the classical picture of organic structures, the expected links as depicted by their correlation coefficients were all present and in the expected directions :

- there was a strong positive correlation between organicity and decentralization,
- there were strong negative correlations with both centralization and standardization, and
- the expected negative correlation with formalization was present but it was quite weak.

So the organicity variable that was used in this study is a valid measure of organic structure in the classical mode.

Figure 8.10 on page 228 indicates that the relationship between organic structure, as characterised by the organicity measure, and environmental uncertainty, and organic structure and dependence are both present and both are in the expected direction. In other words, internal dependence is negatively related to organicity, and

environmental change is positively related to organicity.

The third hypothesis is, therefore, supported by the results of this study. It should be noted, though, that the most important predictor of an organic structure is a negatively directed relationship with power control. This was a connection that was not anticipated in the original hypothesis but it is an important factor. One would expect that a positive relationship with power control would have the capacity to negate the influence of the other two variables as predictors.

2.4. The Fourth Hypothesis : Structural Interrelationships.

The fourth hypothesis stated that :

A number of internal variables and organizational characteristics will exhibit relationships to each other that are consistent with findings in other major organizational research projects throughout the world:

- *Vertical Span of Control or Organization Depth is positively related to Formalization, Functional specialization, Decentralization, Lateral span of control, and the administrative staff ratio.*

- *Formalization is positively related to Functional specialization, Professional qualifications, Decentralization, and the administrative staff ratio.*

- *Functional Specialization is positively related to decentralization and the administrative staff ratio.*

- *Decentralization is positively related to the administrative staff ratio.*

- *Type of structure, shape or configuration is related to Formalization, Functional specialization, and Decentralization.*

The fourth hypothesis was discussed in some depth on pages 171 to 177 and the discussion will not be repeated here, except for the following brief summary.

"Looking at the fourth hypothesis overall, there seemed to be general support for the internal structural relationships that were proposed - with three possible exceptions :

(i) Of five anticipated correlations, Organization Depth showed a weak relationship to one variable and no significant relationship with the other four.

(ii) The relationship between formalization and the Subordinate ratios was also the opposite of what was anticipated.

(iii) Standardization was negatively correlated to both specialization and formalization, contrary to expectations and to the findings of other studies in advanced economies. The relationships between formalization, centralization and standardization or routine also exhibited characteristics which are dissimilar to those found in other studies."

2.5. The Fifth Hypothesis : Organization Climate.

The fifth, and final, hypothesis stated that :

Contextual variables which shape structure will also influence aspects of organization climate. Thus size will be positively related to scientific and intellectual orientation, employee involvement, readiness to innovate, interpersonal aggression, emotional control, leaders' psychological distance, and concern with following rules. Complex Technology is negatively related to emotional control, interpersonal aggression, and leader's psychological distance, and positively related to questioning authority, scientific and intellectual orientation, concern for employee involvement, and readiness to innovate. Dependence will be related positively to emotional

control, interpersonal aggression, rules orientation, and leaders' psychological distance; and negatively to questioning authority, concern for employee involvement, and readiness to innovate. Finally, power control will be positively related to leaders' psychological distance and concern for following rules and negatively related to interpersonal aggression, questioning authority, scientific and intellectual orientation, and concern for employee involvement.

It was decided not to include some of the contextual variables, or any of the 13 structural variables, as independent variables in the original fifth hypothesis. This was simply because the total number of postulated relationships would have swelled to 25 in total and this would have been too cumbersome to control. Nevertheless, the evaluation of *all* of the contextual and structural variables was an integral and very important part of the actual analyses that were carried out.

The hypothesized relationships, therefore, concern only the relationships between organization climate and the selected contextual variables of Organization Size, Technology, Dependence, and Power Control. These are summarised below in figure 9.2 together with the actual results of the multiple regression analysis. The first symbol

Climate :	Context :			
	Size	Tech–nology	Depen–dence	Power Control
1. Scientific & Technical orientation	+ N	+ +	0 –	– –
2. Intellectual orientation	+ N	+ +	0 N	– –
3. Leaders' psychological distance	+ +	– N	+ N	+ +
4. Concern for employee involvement	+ N	+ N	– N	– –
5. Readiness to innovate	+ –	+ N	– –	0 –
6. Interpersonal aggression	+ N	– N	+ N	– +
7. Emotional control	+ N	– N	+ –	0 +
8. Rules orientation	+ N	0 N	+ +	+ N
9. Questioning authority	0 N	+ N	– N	– –

Figure 9.2. Relationships Between Context and Climate.

+ = Positive relationship
– = Negative relationship
0 = No postulated relationship
N = No relationship at 0,05 level

in each cell refers to the hypothesized relationship between the climate variable and the contextual variable while the second symbol refers to the actual relationship.

The relationship of size with the climate variables was only present twice out of the hypothesized eight occasions and one of these was in the opposite direction. In terms of technology, of the eight hypothesized relationships two were confirmed and both were in the direction expected. There were seven hypothesized relationships involving dependence. Three occurred and one of these was in the opposite direction to that expected. Finally, power control embodied seven hypothesized relationships and of these six were present although one was in the opposite direction.

So support for the fifth hypothesis is, at best, sketchy at the 0,05 level of significance. The relationship between organization climate and aspects of context is unclear and does not bear much similarity to other overseas studies. (Payne & Mansfield, 1973 and Payne & Pheysey, 1971b).

Although no hypothesized relationships were put forward for the structural variables and organization climate for the reasons that were set out above, it is clear that many of the relationships that did emerge between these two sets of variables would have been quite different from those that may have been hypothesized on the basis of similar studies carried out elsewhere. This would have been particularly so for relationships involving perceptions of bureaucracy as exemplified by the structural variable of formalization.

2.6. The Research Problem

The research problem that was the basis for this study related to the lack of knowledge about South African organizations, particularly from an *Organization Theory* point of view. The research problem

was broken down into a number of subproblems and these formed the foundation of the research hypotheses. To conclude this discussion on the research hypotheses it will be instructive to briefly revisit each of the subproblems again to establish whether the objectives that they embody have been achieved.

- *The first subproblem was to make a contribution to Organization Theory as it relates to South African business organizations by determining whether there are contingencies and imperatives which shape the structures of companies in the Manufacturing sector.*

  The objectives of the first subproblem were encapsulated in the first research hypothesis. A number of factors were identified and tested and their linkages with the structures of companies was confirmed. In the process, a great deal of empirical information was assembled, sifted and studied. That a contribution was made to the greater *Organization Theory* is beyond doubt, particularly when one considers the paucity of similar research in South Africa.

- *The second subproblem was to evaluate the operating environment of the South African Manufacturing Sector to establish its degree of turbulence and uncertainty; and to identify the major factors, exogenous to organizations, which influence and mould structure.*

  The objectives of the second subproblem were incorporated into the first three research hypotheses. Turbulence and uncertainty were measured by the three environmental scales of Operating Environment, Environmental Change, and Unpredictability. A number of factors exogenous to the organization were treated as contextual or independent variables and their effects on structure were measured and analysed.

- *The third subproblem was to evaluate whether conventional wisdom (e.g. organic structures should predominate in a high technology industry) is applicable to the South African environment.*

Although general support for most *Organization Theory* concepts was established in this study, there were, nevertheless, some noteworthy exceptions. For example, the situation regarding alternative strategies of bureaucratic control; the unexpected effects of formalization on organization climate; and the total lack of influence of specialization on key aspects of climate are just three instances of Organization Theory principals applying differently in a South African context.

- *The Fourth subproblem was to evaluate and analyse the treated data to gauge the effects, if any, of South Africa's uniqueness on its organizational structures.*

The effects of South Africa's uniqueness in terms of its blend of third world and first world cultures and values was apparent in the differing composition of the structuring of activities variables and in the factors that emerged from the factor analysis of all the structural variables. In terms of organization climate, there were also indications of South Africa's uniqueness in the factors that emerged as well as the performance of some of the variables. The unexpected effects of formalization as the most potent measure of bureaucracy is again germane in this context. In addition, the situation with respect to the South African electronics industry and the preponderance of mechanistic structures was another indicator of how this country's uniqueness has affected its organization structures. In this case it was the country's outcast status coupled with trade sanctions and strong government support for strategic industries that was probably the overriding influence on structure.

- *The fifth subproblem was to explore the influence of structure at organization and group level to establish the linkages, if any, between aspects of structure, environment, and organization climate and organization culture.*

The linkages and causal relationships between contextual, structural and organization climate variables are what the bulk of

the previous chapter was about. All of these relationships have been extensively explored both at the industry level and at the group level.

In conclusion, it may confidently be said that the research problem that initiated this study and the subproblems and hypotheses that it spawned have all been adequately addressed and resolved. An inevitable consequence of this exercise has been that the generation of a large amount of information has triggered a host of new questions and potential research directions. In the following section some suggestions are put forward with respect to the possibilities that exist for further research.

3. SUGGESTIONS FOR FURTHER RESEARCH.

The following list of possible research directions is split into three sections: (i) Same population, same data; (ii) New population, same methodology; and (iii) Same population, different methodology. Obviously, the list is not exhaustive and many other useful avenues may occur to the reader.

3.1. Same Population, Same Data

The comprehensive nature of the questionnaire and the gratifying response that it produced has resulted in a very large sample of tested and reliable data. There are many more nuances of information that can still be gleaned from this data base. Some examples may include :

- exploring the linkages between climate and context and structure at SIC subgroup level,
- analysing demographic differences by development region or province, and
- testing the 'reverse life cycle' hypothesis by controlling for age and life cycle stage.

3.2. New Population, Same Methodology.

This study appears to be the first of its kind in South Africa and most of the scales were used for the first time in a local application. The need exists, therefore, for other studies to be done on different populations using the same methodology so that comparative norms can be established. Some directions to follow could include :

- validation of the scales used, both those that were imported and those that were created specially for this study;
- the power control scale was a potent predictor but it is largely untested and needs more work and refinement;
- other contextual and structural variables also need to be identified, operationalized and tested; and
- the aspect of South Africa's uniqueness and the non-applicability of some *Organization Theory* concepts also needs to be pursued in another population.

3.3. Same Population, Different Methodology.

The emphasis of this study was clearly on quantitative methods and the objective was to quantify and measure independent and dependent variables in a parametric, cross-sectional study. The way is thus left open for other approaches to the same research population, which may compliment, amplify or even dispute the results of this study. Some instances could be :

- non-parametric, qualitative studies using interpretive, processual methods at the individual organization level of analysis;
- a longitudinal study of the variables identified in this study; and
- pursuit of a hybrid manufacturing organization structure for South Africa which embodies its uniqueness and that is going to compete successfully with advanced Western economies as well as the Pacific Rim tigers. We have seen in this study that organicity has less to do with structure and more to do with an ethos or philosophy. As such, it was quite possible for organizations to

be both bureaucratic and organic at the same time. In this context, perhaps the concept of 'Ubuntu' applied to South Africa's traditional bureaucracies may be well worth following up.

4. SUMMARY

In this final chapter three objectives were set. Firstly, the research hypotheses were recalled and the degree to which this study supported each hypothesis was evaluated. It was established that there was support for the first and third hypotheses while the fourth had general support with the exception of three of its aspects. There was modest support for the second hypothesis resulting from complete support for two of its dimensions, some support for another two, and no support at all for a fifth dimension. The fifth hypothesis had only superficial support, pointing to significant differences between organization climate in South Africa and a similar study conducted in the United Kingdom.

A second objective of this chapter was to re-evaluate the research problem and its ancillary subproblems to gauge the degree to which the goals embodied in the subproblems had been achieved by this study. The judgment was that all of the subproblems had been successfully resolved.

The third objective of this final chapter was to suggest possible directions for future research. Ten suggestions were put forward, some of which involved further manipulation and treatment of the data gathered for this study; and others involved a completely fresh approach with other sectors of the economy, using either the same or different methodology.

5. CONCLUSION.

And so the point has been reached where a conclusion to this thesis can be written. The path that was travelled began with the identification

of a problem that was worth researching; which then grew into a number of research hypotheses and a fully fledged research project.

A comprehensive review of the related literature and research in other parts of the world was carried out and made up the second and third chapters of this study. The second chapter traced the antecedents of modern day organization theory to its earliest beginnings and looked at the organizational issues with which early Mediterranean and Middle Eastern societies grappled. Some of the more awesome organizational accomplishments of mankind up to and including the industrial revolution and the early modern world were recounted, leading to the first attempts at putting together a cohesive theory about organizations. German sociologist, Max Weber, is generally regarded as being the father of organization theory and a number of schools based on Weber's bureaucratic ideal type were described and contrasted. A lot of attention was paid to the work of the Aston group and to their efforts to operationalize Weberian concepts of bureaucracy and to develop a cogent and replicable body of quantitative research. The replications and extensions of the Aston work throughout the world were outlined.

Chapter three continued the examination of related literature and research and looked at selected works chosen from the mountain of literature that exists under the heading of *Organization Theory*. Points of departure were re-examined and some new twists to Systems Theory and Structural Functionalism were considered. Current views on the influence of the environment and other structural imperatives were considered and a look was taken at the special issues involving high technology companies. The chapter continued with a brief survey of organizational studies that have been carried out in countries other than advanced Western economies. Finally, the major opposing viewpoints of organization theorists were summarised and contrasted and an attempt was made to reconcile the main disputing perspectives by means of a model developed by Astley and Graham (1983).

Chapter four set the tone for the ensuing investigative exercise by defining the principles of the Scientific Method and positioning this study

with respect to certain critical prerequisites of the credibility and relevance of the research. The fifth chapter took a detailed look at all of the key concepts and defined all of the independent and dependent variables both conceptually and operationally; while the sixth chapter described the data gathering instrument - the questionnaire - and compared the demographic characteristics of both the sample and the population from which it was drawn. After a number of statistical parameters were calculated it was concluded that the sample was very representative and the results of the study could, therefore, be generalised to the population with some degree of confidence.

In the seventh chapter the processing and treatment of the data that were gathered by the questionnaire was described. A great deal of care was taken to test and validate each of the scales that comprised the questionnaire. The results of the study would only be as valid and as credible as the data upon which it was based. Reliability statistics, item analyses and factor analysis were carried out for each and every variable and group of variables.

In chapter eight the emphasis shifted to the search for statistical associations and causal relationships between the various sets of variables, both at the sector level and at individual industry subgroup level. A detailed and painstaking analysis was carried out, firstly, on the total sample to establish the linkages between the contextual variables and organization structure. Secondly, a similar analysis was conducted at SIC group level; and, finally, organization climate was examined to establish its predictors both among the contextual variables and the structural variables. A number of areas where this study was both similar to, and different from, other studies were highlighted and discussed.

In the final chapter, the research problem, its subproblems and the research hypotheses were restated and discussed. Some firm conclusions were drawn regarding the degree to which the hypotheses had been supported or not, and whether the research problem and subproblems had been resolved. Finally, some ideas for future research directions were suggested.

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10.2.2 Number of manufacturers by SIC code (Major Division 3)

Type of manufacturer	SIC code	Number
Food	311	1 423
Food n.e.c.	312	195
Beverages industries	313	244
Tobacco products	314	20
	31	1 882
Textiles	321	623
Clothing	322	918
Leather and leather substitutes	323	143
Footwear	324	126
	32	1 810
Wood and cork products	331	600
Furniture and fixtures (wooden)	332	647
	33	1 247
Paper and paper products	341	238
Printing and publishing	342	852
	34	1 090
Industrial chemicals	351	245
Other chemicals	352	476
Petroleum refineries	353	21
Petroleum and coal products	354	49
Rubber products	355	107
Plastic products	356	380
	35	1 278
Pottery and china	361	62
Glass and glass products	362	48
Other non-metallic mineral products	369	780
	36	890
Iron and steel basic industries	371	198
Non-ferrous metal basic industries	372	84
	37	282
Fabricated metal products	381	2 065
Machinery	382	1 135
Electrical machinery	383	671
Motor vehicles and parts	384	569
Transport equipment	385	95
Scientific equipment	386	192
	38	4 727
Other manufacturing	390	692
	39	692
Non-manufacturing head offices and holding companies	300	1 366
	30	1 366
Total		14 964

10.2.3 Number of manufacturers by development and statistical region

Development region	Statistical region	Geographical description*	Number	%
A	01-14	Cape	2 484	16,6
B	15-20 and 22-23	Northern Cape	235	1,6
C	21, 27-34 and 95	Orange Free State and Qwaqwa	537	3,6
D	35-47	Eastern Province	968	6,5
E	48-63 and 90-92	Natal and KwaZulu	2 644	17,7
F	64-67 and 96	Eastern Transvaal and KaNgwane	444	2,9
G	68-70 and 93-94	Northern Transvaal, Gazankulu and Lebowa	303	2,0
H	71-78, 80 and 97	PWV and KwaNdebele	6 732	45,0
J	24-25 and 79	Western Transvaal	348	2,3
I	Other	Other, overseas and neighbouring states	269	1,8
Total			14 964	100,0

*A portion of a TBVC country falling within the boundaries of these geographical regions is included under the relevant region.

10.2.4 Number of manufacturers by province/state

Province/ state code	Geographical description	Number	%
1	Cape Province	3 585	24,0
2	Natal	2 495	16,7
3	Transvaal	7 679	51,3
4	Orange Free State	547	3,6
5	Self-governing states	204	1,4
6	TBVC countries	208	1,4
7	Namibia, Lesotho, Botswana and Swaziland	45	0,3
0	Overseas	201	1,3
Total		14 964	100,0

10.2.5 Number of manufacturers by status

Status	Description	Number	%
0	Unknown	32	0,2
2	Head office	1 889	12,6
3	Branch	1 320	8,8
4	Subsidiary	2 077	13,9
5	Independent unit	9 646	64,5
Total		14 964	100.0

10.2.6 Number of manufacturers by employment group

Size code	Employees	Number	Cumulative Number	Cumulative %
00	Head offices	1 053	1 058	7,1
01	1 - 3	1 053	2 111	14,1
02	4 - 6	1 166	3 277	21,9
03	7 - 10	1 392	4 669	31,2
04	11 - 15	1 278	5 947	39,7
05	16 - 20	977	6 924	46,3
06	21 - 30	1 315	8 239	55,1
07	31 - 40	901	9 140	61,1
08	41 - 50	683	9 823	65,6
09	51 - 60	520	10 343	69,1
10	61 - 80	776	11 119	74,3
11	81 - 100	605	11 724	78,3
12	101 - 150	828	12 552	83,9
13	151 - 200	540	13 092	87,5
14	201 - 300	606	13 698	91,5
15	301 - 400	341	14 039	93,8
16	401 - 500	230	14 269	95,4
17	501 - 600	140	14 409	96,3
18	601 - 800	194	14 603	97,6
19	801 - 1 000	87	14 690	98,2
20	1 001 - 1 500	128	14 818	99,0
21	1 501 - 3 000	77	14 895	99,5
22	3 001 - 5 000	23	14 918	99,7
23	5 001+	14	14 932	99,8
24	Unknown	32	14 964	100,0
Total		14 964		

10.2.7 Number of manufacturers by electricity group

Size code	Electricity (kW.h)	Number	Cumulative Number	Cumulative %
00	Head offices	1 312	1 312	8,8
01	1 - 1 000	1 857	3 169	21,2
02	1 001 - 2 000	1 575	4 744	31,7
03	2 001 - 4 000	1 772	6 516	43,5
04	4 001 - 7 000	1 576	8 092	54,1
05	7 001 - 11 000	1 119	9 211	61,6
06	11 001 - 16 000	818	10 029	67,0
07	16 001 - 23 000	751	10 780	72,0
08	23 001 - 32 000	676	11 456	76,6
09	32 001 - 44 000	570	12 026	80,4
10	44 001 - 60 000	431	12 457	83,2
11	60 001 - 80 000	348	12 805	85,5
12	80 001 - 110 000	331	13 136	87,8
13	110 001 - 150 000	267	13 403	89,6
14	150 001 - 200 000	229	13 632	91,1
15	200 001 - 270 000	188	13 820	92,4
16	270 001 - 360 000	161	13 981	93,4
17	360 001 - 460 000	109	14 090	94,2
18	460 001 - 580 000	90	14 180	94,8
19	580 001 - 730 000	81	14 261	95,3
20	730 001 - 930 000	52	14 313	95,6
21	930 001 - 1 200 000	38	14 351	95,9
22	1 200 001 - 1 600 000	31	14 382	96,1
23	1 600 001+	144	14 526	97,1
24	Unknown	438	14 964	100,0
Total		14 964		

RESPONSE SUMMARY

Total number of Questionnaires posted	=	2288	
Less :			
Duplications, returns and errors, say	=	200	
TOTAL POPULATION		2088	
Total number of questionnaires returned	=	528	(25,3%)
Total number of usable questionnaires	=	458	(22,0%)

NUMBER OF RESPONDENTS BY JOB TITLE

Group General Manager	x 54
Divisional General Manager	x 71
General Manager	x 141
Group HR Manager	x 18
Senior HR Manager	x 35
Other	x 139

Breakdown of Respondents in Category of 'Other'.

Accountant	x 7	HR Officer	x 1
Admin Director	x 1	Indust. Eng Manager	x 1
Admin Manager	x 3	Maintenance Manager	x 1
Admin & Audit Manager	x 1	Managing Director	x 23
Business Manager	x 1	Manufacturing Manager	x 1
Chief Accountant	x 2	Man. Mkt Intelligence	x 1
Chief Executive	x 4	Marketing Director	x 2
Commercial Manager	x 1	Mat & Syst Manager	x 1
Controller	x 1	Mfg Div Director	x 1
Cost Accountant	x 1	Mktng Manager	x 1
Department Manager	x 1	Not Stated	x 8
Director	x 7	Operations Manager	x 5
Div Financial Dir	x 1	Owner	x 1
Div Ops Manager	x 1	Owner Manager/MD	x 2
Executive Director	x 2	PA to GM/MD	x 2
Executive Officer	x 1	Production Director	x 3
Factory manager	x 4	Production Manager	x 4
Finance/HR Man	x 1	Productivity Services Ma	x 1
Finance/Pers Man	x 1	QA Manager	x 1
Financial Director	x 14	Quality Manager	x 1
Financial Manager	x 9	Quality Syst Manager	x 1
Grp Fin Man	x 1	Sales Director	x 1
Grp Financial Director	x 1	Sales & Prod Manager	x 1
Grp Ops Man	x 1	Tech Director	x 1
Harvesting Man.	x 1	Technical Manager	x 2
Head Mkt Serv	x 1	Works Manager	x 2

Organization Structure and Context : a South African Study.

Organization Structure and Context :

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This questionnaire has been designed for computer analysis and, for the most part, all that you need to do is circle the number that best describes your response to the statement or question. In a few cases, where specific information is called for, it may be that you are not able to provide precise data. In that case, please provide your best guess or estimation, preferably after conferring with colleagues.

The anonymity of all respondents will be strictly observed and guaranteed, so please do not write your name on the questionnaire. A good response rate is essential for a survey of this nature. The questionnaires have been numbered purely for administrative purposes, and to make it possible to send reminders to companies if necessary.

If you would like to add any additional comments, please use the space provided at the end of the questionnaire. If any aspect of the questionnaire is not clear, or if you have queries, please contact the researcher at the contact telephone number provided on the last page.

When you have finished please return the completed questionnaire in the enclosed postage-paid envelope.

1. SIZE AND DEPENDENCE

Please circle your response where applicable. Where you cannot provide precise information, please give your best guess or estimate :

1.1. Origin

Was your company founded by

	(Circle)
A person or persons, i.e. not an existing organization	1
An existing organisation	2

1.2. Status of organisation unit

Is your company a

	(Circle)
Principal unit	1
Subsidiary (with legal identity)	2
Main branch (with headquarters at the same location)	3
Branch	4

1.3. Public accountability of owning group

Is the unit or group which ultimately owns your company

	(Circle)
Unquoted	1
Quoted on the stock exchange	2
Foreign Multinational	3
State or para-statal	4

1.4. Size of organization, and size relative to owning group

Approximately how many employees are there in your company? Please write the number in the box below :

Total no. of employees [ ]

How big is your company (in terms of headcount) relative to the unit or group that ultimately owns your company?

	(Circle)
Over 90% of owning group	1
30 – 89% of owning group	2
5 – 29% of owning group	3
Under 5% of owning group	4

2. TECHNOLOGY

2.1. Workflow Integration

Which of the following categories best describes :

(a) the BULK of the equipment used by the organization in its workflow, and
(b) the most AUTOMATIC piece of equipment used by the organization in its workflow.

Please circle the highest number in column (a). Do the same in column (b):

	(a) *the bulk of equipment* (circle one only)	(b) *the most automatic* (circle one only)
Handtools and manual machines (e.g. pliers, hammer, file, screwdriver, etc.)	0	0
Powered machines and tools Muscles are replaced for the basic machine function, but machine action and control are completely dependent on the operator. Uses mechanical power but man positions work and machine for desired action. (e.g. electric tools, soldering iron, etc.)	1	1
Single–cycle automatic and self–feeding machines Completes an action when initiated by an operator. Operator must set up, load, initiate actions, adjust, and unload. (e.g. production machines without automatic control systems)	2	2
Automatic which repeats cycles All energy is mechanized and carries out routine instructions without aid by man. Starts cycle and repeats action automatically. Self–feeding : loads, goes through sequence of operations and unloads to next station or machine. Not self–correcting but obeys internal program such as cams, tapes or cards. (e.g production lines, self–feeding press lines etc.)	3	3
Self–measuring and adjusting by feedback Measures and compares results to desired state and adjusts to minimize error. Information activities are increasingly automated and judgement is the human attribute mechanized. (e.g. feedback from product, automatic sizing, positional control of machine table or tools)	4	4
Computer controlled : automatic cognition Evaluation is the human attribute mechanized. Computer monitors multiple factors on which machine or process performance is predicated; evaluates and reconciles by means of computer operations to determine proper control actions.	5	5

2.2 . Process Technology

Please indicate the extent to which each of the five technologies listed below are used in your organization :

TECHNOLOGIES	EXTENT TO WHICH THEY ARE USED (circle one on every line)						
	Not used	Very slightly	Slightly	Moderately	Considerably	Extensively	Exclusively
1. **Custom technology** : production or fabrication of a single or few units to customer specifications.	1	2	3	4	5	6	7
2. **Small batch (job shop) technology** : production of small batches	1	2	3	4	5	6	7
3. **Large batch technology** : production of large batches such as components for subsequent assembly, or of finished products.	1	2	3	4	5	6	7
4. **Mass production technology** : as on an assembly line	1	2	3	4	5	6	7
5. **Continuous process technology** : production of liquids, gasses, or solid shapes.	1	2	3	4	5	6	7

3.1. Control, Change & Uncertainty

Please indicate your response by circling the number that best describes the extent to which the statement applies to your company :

		Entirely untrue	Mainly untrue	Slightly untrue	50% true	Slightly true	Mainly true	Entirely true
1.	The structure of the organization tends to remain constant, despite changes to its strategy.	1	2	3	4	5	6	7
2.	The organization's structure is mainly a result of those in power selecting a structure that will maximize and enhance their control.	1	2	3	4	5	6	7
3.	Managers often try to "sell" self-serving ideas and decisions by packaging them in terms of organizational effectiveness.	1	2	3	4	5	6	7
4.	The strategic choices exercised by the company's senior management are never illogical.	1	2	3	4	5	6	7
5.	Those who hold real power in the organization are not always the same as those who hold formal authority in top management positioms.	1	2	3	4	5	6	7
6.	Fluctuations in size don't really affect the way that this organization is structured.	1	2	3	4	5	6	7
7.	Decisions taken by senior management are never inconsistent with the overall goals of the organization.	1	2	3	4	5	6	7
8.	The structure of the organization does not change as a result of changes in its prevailing technology.	1	2	3	4	5	6	7
9.	Even though the operating environment may change the structure of this organization remains constant over time.	1	2	3	4	5	6	7
10.	The jobs or positions occupied in the company change quite considerably over a five-year period.	1	2	3	4	5	6	7
11.	Changes in the social, economic, or political conditions outside the company affect the organization and its work.	1	2	3	4	5	6	7
12.	People in the organization find that ideas in the community or their professions influence the methods and techniques that they use.	1	2	3	4	5	6	7
13.	People in the organization are sometimes uncertain of the requirements or methods to be used in their work.	1	2	3	4	5	6	7
14.	New techniques or methods are often applied to the jobs that are done in the organization.	1	2	3	4	5	6	7
15.	The people in the organization often encounter new types of problems in their work.	1	2	3	4	5	6	7

3.2. Predictability

Please rate the following variables according to the situation as it applies in your organization. Again, if you are not certain please give your best guess.

		Highly predictable	Somewhat predictable	Difficult to say	Somewhat unpredictable	Highly unpredictable
1.	**Operations technology**	1	2	3	4	5
2.	**Competitors' actions**	1	2	3	4	5
3.	**Market demand**	1	2	3	4	5
4.	**Product attributes/design**	1	2	3	4	5
5.	**Raw material availability**	1	2	3	4	5
6.	**Government regulations**	1	2	3	4	5
7.	**Labour union actions**	1	2	3	4	5
8.	**Raw material price**	1	2	3	4	5

3. STRUCTURAL CONTROL AND ENVIRONMENT (Cont.)

3.3. Operating Environment

Over the past ten years (1985 to 1994), which of the following statements best describes the typical situation in your organization's operating environment. Please confine your evaluation to the typical operating environment and **do not include the recent political changes** in your assessment.

		(Circle)
1.	**Your organization's familiarity with events in its operating environment**	
	nothing really changed much in the environment	1
	changes in the environment were repetitions of past experience	2
	changes were understood when we thought of historical development	3
	changes were different, but we explained them when we thought of past experience	4
	changes were new and not experienced before.	5
2.	**The response of your organization to changes in its operating environment**	
	things changed in the environment much slower than our response to them	1
	things changed in the environment somewhat slower than our response to them	2
	the speed of change in the environment was comparable with our response to it	3
	things changed in the environment somewhat faster than our response to them	4
	things changed in the environment much faster than our response to them	5
3.	**The visibility of the future in the organization's operating environment**	
	the environment remained substantially unchanged	1
	the environment evolved in a historically logical manner	2
	the environment was predictable through analysis of threats and opportunities	3
	the environment was difficult to predict	4
	the environment was characterized by unpredictable surprises	5
4.	**The scope of your organization's business operations**	
	the scope of business operations was local	1
	the scope of business operations was national	2
	the scope of business operations was local plus adjacent countries	3
	the scope of business operations included most of Africa	4
	the scope of business operations was global	5

4. STRUCTURING OF ACTIVITIES

Please circle your response where applicable. Where you cannot provide precise information, please give your best guess or estimate :

4.1. Functional Specialization

This section is designed to establish the number of functions in your organization. If there is at least one person who performs the function full time, please circle the "yes" option. Status of the incumbent is immaterial – there need be only one person engaged full time on the function for you to answer yes. If no single person is engaged full time on the function, circle the "no" option.

			(Circle)
1.	Develop, legitimize and symbolize the organization's purpose	(e.g. public relations, advertising, etc.)	1. YES / NO
2.	Dispose, distribute or service the products of your organization	(e.g. sales, service, customer complaints, etc.)	2. YES / NO
3.	Carry the outputs and resources from place to place	(e.g. transport)	3. YES / NO
4.	Acquire and allocate human resources	(e.g. employment)	4. YES / NO
5.	Develop and transform human resources	(e.g. education, training)	5. YES / NO
6.	Maintain human resources & promote identification with the orgization	(e.g. welfare, safety, sport, social, etc.)	6. YES / NO
7.	Obtain and control materials and equipment	(e.g. buying, material control, stores, stock control)	7. YES / NO
8.	Maintain and erect buildings and equipment	(e.g. maintenance, works engineer)	8. YES / NO
9.	Record and control financial resources	(e.g. accounts, costing, wages)	9. YES / NO
10.	Control the workflow	(e.g. planning, progress chasing)	10. YES / NO
11.	Control the quality of materials, equipment and outputs	(e.g. inspection and Testing)	11. YES / NO
12.	Assess and devise ways of producing the output	(e.g. work study, O and M study, industrial engineering)	12. YES / NO
13.	Devise new outputs, euipment and processes	(e.g. research and development)	13. YES / NO
14.	Develop and operate administrative procedures	(e.g. registry, filing, statistics, etc.)	14. YES / NO
15.	Deal with legal and insurance requirements	(e.g. legal, registrar, company secretary, licencing, etc.)	15. YES / NO
16.	Acquire information on the operational field	(e.g. market research)	16. YES / NO
17.	Process information	(e.g. electronic data processing)	17. YES / NO

4.2. Formalization

The degree of formalization in an organization is indicated by the number of specific, role–defining documents from the following list that exist in the organization and, in some cases, by the extent of their application and distribution.

		(Circle)
1. Information booklets are given to : (circle one)	none	0
	few employees	1
	many employees	2
	all employees	3
2. Number of information booklets : (circle one)	none	0
	one	1
	two	2
	three	3
	four or more	4
3. Organization charts are given to : (circle one)	none	0
	chief executive only	1
	chief executive plus one other executive	2
	chief executive + all/most department heads	3
4. Written job descriptions are available for : (circle as applicable)	direct workers	YES / NO
	line supervisors	YES / NO
	staff other than line supervisors	YES / NO
	the chief executive	YES / NO
5. Written operating instructions are issued to all direct workers		YES / NO
6. A manual of procedures is available		YES / NO
7. Written policies are available		YES / NO
8. There is a written production schedule or programme		YES / NO
9. There are written research programmes or reports		YES / NO

4.3. Standardization/Routinization

The following statements concern the amount of routine work involved in your organization. Even though it may be hard to decide, be sure not to miss any questions :

			(Circle)
1.	**How would you describe the amount of routine in your job?**	highly routine	1
		somewhat routine	2
		somewhat non–routine	3
		highly non–routine	4
2.	**People in this organization do the same job in the same way every day**	definitely true	1
		more true than false	2
		more false than true	3
		definitely false	4
3.	**One thing people like in this organization is the variety of work**	definitely true	1
		more true than false	2
		more false than true	3
		definitely false	4
4.	**Most jobs have something new happening every day**	definitely true	1
		more true than false	2
		more false than true	3
		definitely false	4
5.	**There is something different to do every day**	definitely true	1
		more true than false	2
		more false than true	3
		definitely false	4

4.4. Configuration.

Configuration refers to the actual physical shape of an organization in terms of its height and horizontal span. It is unlikely that you would have precise information on all of the variables, so please provide approximations based on your best guess :

1.	How many subordinates, irrespective of their status, report directly, with no intervening levels, to the chief executive?	
2.	At the lowest level of the organization, approximately how many subordinates (direct workers) are there per first line supervisor?	
3.	How many jobs or layers are there in the longest line between direct workers and chief executive (inclusive of both), excluding secretaries & assistants?	
4.	Approximately what percentage of the jobs in your organization are occupied by managers or supervisors?	%
5.	Approximately what percentage of the jobs in your organization are occupied by employees who have no direct or supervisory responsibility for work on outputs?	%
6.	What percentage of employees are engaged purely in clerical duties?	%

5. CENTRALIZATION

5.1. Concentration of Authority

Concentration of authority describes the level at which formal authority rests. Authority means action can be taken without waiting for confirmation, even if the decision is later ratified at a higher level. "Inside the organization" means at the level of the chief executive or below. Above the chief executive means at controlling board or parent company level, or at head office departmental level, where applicable.

	AUTHORITY TO DECIDE	IS AUTHORITY INSIDE THE ORGANIZATION? (circle)	
1.	Managerial Headcount/establishment	YES	NO
2.	Appointment of managerial staff from outside the organization	YES	NO
3.	Promotion of managerial staff	YES	NO
4.	Salaries of managerial staff	YES	NO
5.	To dismiss a manager	YES	NO
6.	To determine a new product or service	YES	NO
7.	To determine marketing territories covered	YES	NO
8.	The extent and type of market to be aimed for	YES	NO
9.	The price of output	YES	NO
10.	What type, or what brand, new equipment is to be purchased	YES	NO
11.	What shall be costed and included in the costing system	YES	NO
12.	What shall be inspected and included in the inspection system	YES	NO
13.	What operations shall be work studied	YES	NO
14.	What suppliers of materials are to be used	YES	NO
15.	What procedures are to be followed when buying materials	YES	NO
16.	Training methods to be used	YES	NO
17.	What, and how many, welfare facilities are to be provided	YES	NO
18.	To spend unbudgeted or unallocated money on capital items	YES	NO
19.	To spend unbudgeted or unallocated money on revenue items	YES	NO
20.	To alter responsibilities / areas of work of specialist departments	YES	NO
21.	To alter responsibilities / areas of work of line departments	YES	NO
22.	To create a new department	YES	NO
23.	To create a new job	YES	NO

5.2. Policy Decision Making

		(circle)
1.	**Who makes major policy decisions?**	
	a broad representation of executives and shareholders	1
	a top level executive committee	2
	the chief executive or the owner acting on their own	3
2.	**Who makes decisions concerning sales policy?**	
	an executive committee with representation of all functional areas	1
	the chief executive with the help of the sales manager	2
	the chief executive or owner only	3
3.	**Who decides upon the product mix?**	
	an executive committee with representation of all functional areas	1
	the chief executive with the help of the production or marketing manager	2
	the chief executive or owner only	3
4	**Who decides upon production standards?**	
	an executive committee with representation of all functional areas	1
	The chief executive or the production manager, or both together	2
	the chief executive or owner only	3
5.	**Who decides upon manpower policies?**	
	an executive committee with representation of all functional areas	1
	the chief executive with human resources manager	2
	the chief executive or owner only	3
6.	**Who decides upon the selection of Executive Personnel?**	
	an executive committee with representation of all functional areas	1
	the chief executive with human resources manager	2
	the chief executive or owner only	3

5.3. Decision Making & Discretion

			(circle)
1.	**How much direct involvement does top management have in gathering the information they will use in making decisions?**		
		none	1
		little	2
		some	3
		a great deal	4
		a very great deal	5
2.	**To what degree does top management participate in the interpretation of the information input?**		
		0 – 20%	1
		21 – 40%	2
		41 – 60%	3
		61 – 80%	4
		81 – 100%	5
3.	**To what degree does top management directly control execution of the decision?**		
		0 – 20%	1
		21 – 40%	2
		41 – 60%	3
		61 – 80%	4
		81 – 100%	5
4.	**How much discretion does the typical first–line supervisor have over establishing his or her unit's budget?**		
		very great	1
		great	2
		some	3
		little	4
		none	5
5.	**How much discretion does the typical first–line supervisor have over determining how his unit's performance will be evaluated?**		
		very great	1
		great	2
		some	3
		little	4
		none	5
6.	**How much discretion does the typical first–line supervisor have over hiring and firing personnel?**		
		very great	1
		great	2
		some	3
		little	4
		none	5

5.3. Decision Making & Discretion (cont.)

7. **How much discretion does the typical first-line supervisor have over personnel rewards (i.e. salary increases, promotions)**

very great	1
great	2
some	3
little	4
none	5

8. **How much discretion does the typical first-line supervisor have over purchasing of equipment and supplies?**

very great	1
great	2
some	3
little	4
none	5

9. **How much discretion does the typical first-line supervisor have over establishing a new project or programme?**

very great	1
great	2
some	3
little	4
none	5

10. **How much discretion does the typical first-line supervisor have over how work exceptions are to be handled?**

very great	1
great	2
some	3
little	4
none	5

6. ORGANICITY

6.1. Operating Management Philosophy

Organicity refers to the degree to which your company is characterized by informal control mechanisms, flexibility, and open communication channels.

In general, the operating management philosophy in my firm favours...

	(circle)	
Highly structured channels of communication and a highly restricted access to important financial and operating information	1 2 3 4 5 6 7	Open channels of communication with important financial and operating information flowing quite freely throughout the organization
A strong insistance on a uniform managerial style throughout the organization	1 2 3 4 5 6 7	Managers' operating styles allowed to range freely from very formal to the very informal
A strong emphasis on giving the most say in decision making to formal line managers	1 2 3 4 5 6 7	A strong tendency to let the expert in a given situation have the most say in decision making, even if this means temporarily by-passing formal line authority
A strong emphasis on holding fast to tried and true management principles despite any changes in business conditions	1 2 3 4 5 6 7	A strong emphasis to adapting freely to changing circumstances without too much concern for past practice
A strong emphasis on always getting personnel to follow the formally laid down procedures	1 2 3 4 5 6 7	A strong emphasis on getting things done even if this means disregarding formal procedures
Tight formal control of most operations by means of sophisticated control and information systems	1 2 3 4 5 6 7	Loose, informal control; heavy dependence on informal relationships and norm of cooperation for getting work done
A strong emphasis on getting line and staff personnel to adhere closely to formal job descriptions	1 2 3 4 5 6 7	A strong tendency to let the requirements of the situation and the individual's personality define proper on-the-job behaviour

7. ORGANIZATION CLIMATE

In addition to context and structure, organizations also need processes that help them achieve their goals. The following section looks at the organizational processes within your company.

Please indicate your response by circling the number that best describes the extent to which the statement applies to your company :

		Totally false	Mainly false	Mainly true	Totally true
1.	Applications of research, experimental analysis, and other forms of scientific method are encouraged.	1	2	3	4
2.	A discussion about the latest technical developments would not be uncommon in this organization.	1	2	3	4
3.	Few people would be interested in attending a lecture by an outstanding scientist.	1	2	3	4
4.	Few people in this organization have any background in science.	1	2	3	4
5.	A discussion about the latest scientific inventions would not be uncommon here.	1	2	3	4
6.	Magazines about new developments in science and management techniques are read by many people who work here.	1	2	3	4
7.	Senior personnel here are considered experts in their respective fields.	1	2	3	4
8.	This organization is research conscious.	1	2	3	4
9.	People here spend a great deal of time thinking about and discussing complex problems.	1	2	3	4
10.	Few people here would be interested in attending a lecture by an outstanding industrialist.	1	2	3	4
11.	Few people here are stimulated by intellectual activities and problems.	1	2	3	4
12.	Few people here are challenged by deep thinking.	1	2	3	4
13.	Most people here are well-read.	1	2	3	4
14.	People here often get involved in long serious intellectual discussions.	1	2	3	4
15.	People who attempt discussions on serious subjects are made to feel foolish and out of place here.	1	2	3	4
16.	Careful reasoning and clear logic are highly valued here.	1	2	3	4
17.	Important people here are always addressed as "Sir".	1	2	3	4
18.	It's necessary to be polite under all circumstances to stay out of trouble here.	1	2	3	4
19.	Senior personnel rarely refer to one another by their first names.	1	2	3	4
20.	The important people in this place expect others to show proper respect for them.	1	2	3	4
21.	People here are always looking for compliments.	1	2	3	4
22.	Senior personnel are frequently jealous of their authority.	1	2	3	4
23.	There is a lot of boot-licking around here.	1	2	3	4
24.	There is a recognised group of leaders who receive special privileges.	1	2	3	4
25.	Policy goals and objectives are carefully explained to everyone.	1	2	3	4
26.	Criticism or advice from a superior is usually welcomed.	1	2	3	4
27.	Regulations are interpreted and enforced in an understanding manner.	1	2	3	4
28.	There are few opportunities for informal conversation with senior personnel.	1	2	3	4
29.	This organization does not concern itself with the personal problems of the people who work here.	1	2	3	4
30.	Senior personnel have little tolerance for complaints and protests.	1	2	3	4

7. ORGANIZATION CLIMATE (Cont.)

		Totally false	Mainly false	Mainly true	Totally true
31.	Senior personnel will go out of their way to help you with your work.	1	2	3	4
32.	Senior personnel are prepared to listen to people as well as direct them.	1	2	3	4
33	Policy changes occur slowly here and only after considerable deliberation.	1	2	3	4
34.	Quick decisions and actions are not characteristic of this place.	1	2	3	4
35.	Thinking of alternative ways in which problems might be solved or things done differently is discouraged here.	1	2	3	4
36.	New ideas are always being tried out here.	1	2	3	4
37.	The latest scientific discoveries make few changes in the way this place is run.	1	2	3	4
38.	Unusual or exciting plans are encouraged here.	1	2	3	4
39.	There are conventional ways of doing things here which are rarely changed.	1	2	3	4
40.	Programmes here are quickly changed to meet new conditions.	1	2	3	4
41.	People are always trying to manipulate the activities of others for their own advantage.	1	2	3	4
42.	People can get into very heated arguments with one another, and be the best of friends the next day.	1	2	3	4
43.	Almost everyone is likely to be blamed, even those who had little to do with it, if some thing happens to go wrong.	1	2	3	4
44.	Personal rivalries are fairly common in this place.	1	2	3	4
45.	A lot of people in this place walk around with a chip on their shoulder.	1	2	3	4
46.	There always seems to be a lot of little quarrels going on here.	1	2	3	4
47.	People here are always trying to win an argument.	1	2	3	4
48.	Many people here seem to brood a lot, act moodily and it is hard to make them out.	1	2	3	4
49.	People here express their feelings openly.	1	2	3	4
50.	Discussions get quite heated with a lot of display of feeling.	1	2	3	4
51.	People here do not try to hide their feelings.	1	2	3	4
52.	There are very few issues here that arouse much excitement or feeling.	1	2	3	4
53.	Open displays of emotion have no place here.	1	2	3	4
54.	When people dislike someone here they make no secret of it.	1	2	3	4
55.	People here tend to hide their deeper feelings from each other.	1	2	3	4
56.	People here can be wildly happy one minute and hopelessly depressed the next.	1	2	3	4
57.	People are expected to report violations of rules and regulations.	1	2	3	4
58.	Attendance is checked carefully.	1	2	3	4
59.	People quickly learn what is done and not done around here.	1	2	3	4
60.	Most people pay little attention to rules and regulations.	1	2	3	4
61.	People ask permission before deviating from common policies or practice.	1	2	3	4
62.	Formal rules and regulations have a very important place here.	1	2	3	4
63.	Procedures to be followed in case of fires and accidents are not prominently displayed.	1	2	3	4
64.	It is expected that there will be no deviation from established practices, no matter what the circumstances.	1	2	3	4

		Totally false	Mainly false	Mainly true	Totally true
65.	Criticism of policies and practices is encouraged.	1	2	3	4
66.	When people disagree with a decision, they work to get it changed.	1	2	3	4
67.	People here are not likely to accept managerial ineptitude without complaint or protest.	1	2	3	4
68.	When people dislike policy they let it be known in no uncertain terms.	1	2	3	4
69.	People avoid direct clashes with senior personnel at all costs.	1	2	3	4
70.	Many people will not hesitate to give strong support to a project to which senior management is opposed.	1	2	3	4
71.	People who get pushed around here are expected to fight back.	1	2	3	4
72.	People delight in challenging official policies.	1	2	3	4

8. BACKGROUND INFORMATION

8.1 . Position of Respondent.

Please indicate which of the following titles best describes your position in the company :

	(circle)
Group General Manager	1
Divisional General Manager	2
General Manager	3
Group Human Resources Manager	4
Senior Human Resources Manager	5
Other (please specify)	6

8.2. Life–cycle stage.

Please indicate the stage of development of your company :

	(circle)
Infancy The organization has recently been formed and is still establishing its products and services in the market place.	1
Growth The organization has established its position in the market and its annual sales are rapidly increasing.	2
Maturity The organization has an established reputation and its growth rate has stabilized.	3
Diversification The growth and profitability of the organization's traditional products and services have declined and new products and areas of activity have been embarked upon to provide sustained growth and profitability.	4

8. BACKGROUND INFORMATION (Cont.)

8.3. Major Industry.

Please indicate the major industry that your company is involved in by circling one of the following options :

	(circle)
Autombile and related industries	1
Computer / Electronics	2
Comsumer goods	3
Banking / Finance / Travel	4
Industrial Equipment or supplies	5
Pharmaceuticals / Hospital & health supplies	6
Mining and Quarrying	7
Petroleum and related imdustries	8
Chemicals	9
Insurance	10
Advertising	11
Publishing	12
Construction	13
Agricultural Equipment or supplies	14
Distrubution of consumer goods	15
Distribution of industrial goods	16
Other (please specify).....	17
.....	

What sector(s) would you describe your major operations as encompassing? Please circle as many as appropriate :

	(circle as appropriate)
Manufacturing : Primary	1
Manufacturing : Secondary	2
Service	3
Supply	4
Retail	5
Import / Export	6
Public Administration	7
Other (please specify).....	8

8.4. Age of Organization

Please indicate the age of your company :

	(circle)
less than 5 years	1
6 to 9 years	2
10 to 19 years	3
20 to 29 years	4
30 or more years	5

8.5. Turnover

Please indicate the approximate annual turnover of your company :

	(circle)
less than R1 million	1
R1 million to R2,5 million	2
R2,5 million to R5 million	3
R5 million to R10 million	4
R10 million to R25 million	5
R25 million to R50 million	6
more than R50 million	7

8.6. Integration with suppliers and customers

Please describe your company's relationship with its single biggest supplier :

	(circle)
Small outlet (less than 9% of raw material comes from one supplier)	1
Minor outlet (more than 9% of raw material comes from one supplier)	2
Medium outlet (more than 35% of raw material comes from one supplier)	3
Major outlet (more than 75% of raw material comes from one supplier)	4

Please describe your company's relationship with its single biggest customer :

	(circle)
Small outlet (less than 9% of output goes to one customer)	1
Minor outlet (more than 9% of output goes to one customer)	2
Medium outlet (more than 35% of output goes to one customer)	3
Major outlet (more than 75% of output goes to one customer)	4

Thank you so much for taking the time to assist in this important research project. Please check to make sure that you have not missed any questions. Feel free to contact the researcher on telephone (011) 899-6301 if you have any queries. Ask for Bill Raubenheimer.

Additional Comments :

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Annexure 4

SBL
GRADUATE SCHOOL OF BUSINESS LEADERSHIP
NAGRAADSE SKOOL VIR BEDRYFSLEIDING

UNIVERSITY OF SOUTH AFRICA
UNIVERSITEIT VAN SUID-AFRIKA

AT MIDRAND

Dear Executive

The Structure and Functioning of Manufacturing Organizations.

The purpose of this letter is to introduce you to a ground–breaking research project, and to request your assistance and participation by completing a simple questionnaire. The data from this study will form the basis for a Doctoral Thesis. The field covered by this research has not been undertaken before in South Africa and we believe that it is of particular importance at this point in our history.

The intention is to analyse structural relationships in manufacturing organizations to establish how organization structures that compliment effectiveness and enhance competitiveness are brought about. At the same time the research will attempt to evaluate whether or not Organisation Theory principles developed in advanced economies are applicable to our rather unique situation.

Your assistance in providing information is, therefore, of critical importance as a good–sized sample will be necessary to draw meaningful conclusions. Participants in a pilot study found that the concepts and questions posed were interesting and thought–provoking in themselves. We are sure that you will too.

Although the Questionnaire may seem quite lengthy, it is fairly easy to complete and, for the most part, all you need do is choose among a number of alternatives by circling your response to a partic–ular statement or question. It should not take more than 30 minutes of your time.

Your responses will obviously be treated in the strictest confidence. The Questionnaires are numbered purely for administrative purposes and to facilitate reminders, where necessary. Please feel free to contact the researcher at the telephone number provided on the last page of the question–naire if you have any queries, or if you want to receive a copy of the research summary.

Thank you so much for your assistance and we look forward to receiving your input into this important project.

Yours Sincerely,

Professor Johan Murphy

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